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# Progress in the Use of Zonolite

## Crude Material Being Shipped for Heat Treating Locally, to Save High Cost of Transportation

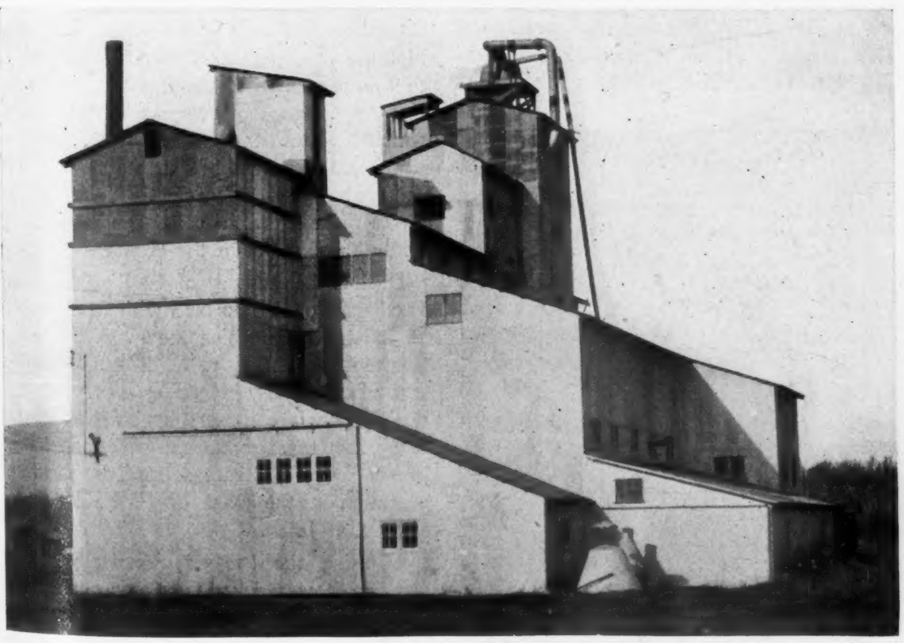
ABOUT the year 1919 news was passed by word of mouth of a large deposit of rock at Libby, Mont., which, as one engineer put it, "has properties that are worth a million bucks but what the h—l can it be used for?" The rock did have properties worth a million bucks and human ingenuity has to date found no less than 30 uses for it.

The first published description of zonolite was in ROCK PRODUCTS, June 26, 1926, "Zonolite, a New Light-Weight Insulator," by James Keeth, who wrote that his attention was first attracted to it in 1921.

The characteristics of zonolite are unique and many difficulties had to be overcome in commercializing the deposit. In the first place the mineral, when heated, expands to some 15 times its original volume so that a standard railroad box car only holds about 12 tons, making freight charges prohibitive. This characteristic would not have been such a factor if the deposit had been located close to points of consumption, but Libby, in the northwestern part of Montana and a short distance from the Canadian border, is far from points of consumption.

It was by word of mouth that the value of zonolite became known to engineers and manufacturers in eastern states, but today those interested in acoustics, gypsum products, heat insulation, etc., are fairly familiar with its general properties. So engineers and chemists for the past 10 years have been playing with the mineral and have lifted it from a plaything to a commercial success.

The deposit at Libby is known locally as Zonolite mountain. It is about seven miles east of the town and about three miles from the Great Northern railroad. An aerial tramway is now being constructed from the mine to the railroad and is expected to be in operation by June, 1932.



*Plant of the Zonolite Co., Libby, Mont.*

At the present time the property is being worked from the top as an open quarry. The overburden, which varies from 10-in. to 2 ft., is scraped off and a face of pure zonolite about 30 ft. wide and 150 ft. long constitutes the present working pit. Engineers estimate that the deposit contains at least 25,000,000 tons of the mineral.

### *Characteristics of the Mineral*

Some of the physical and chemical characteristics of zonolite are shown below:

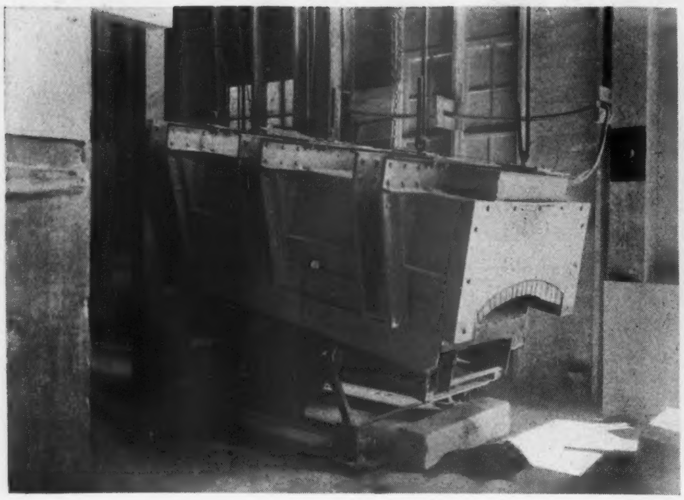
| | Per cent. |
|---|---|
| Loss on ignition | 0.7 |
| Silica | 42.8 |
| Iron and aluminum oxides | 26.2 |
| Calcium oxide | 1.9 |
| Magnesium oxide | 24.6 |
| Sodium and potassium oxides | 3.8 |
| | 100.0 |

It apparently has the same elements as biotite or black mica but in different proportions. Raw zonolite has a specific gravity of 2.5, while the treated zonolite has an apparent specific gravity of plus .087 when the grains are sized before expanding them. The weights of the raw and treated zonolite as compared with other materials are as follows:

| | Weight cu. ft. |
|---|---|
| Aluminum | 126 lb. |
| Gypsum, finished | 77 |
| Cork | 15 |
| Zonolite, raw | 100 |
| Zonolite, furnace run | 10 |
| Zonolite, lump | 6 |

The use of zonolite in the wallboard industry and for acoustical and heat insulation purposes is more or less well known, but several other unique uses have been found for the mineral. One inventor has used this light, porous, noncombustible material for an automobile muffler and it has been so successful that some of the better cars are equipped with this type of muffler.

Another inventor pulverized the raw material and with a suitable cement, probably




*Two views of electric furnace used in expanding zonolite*

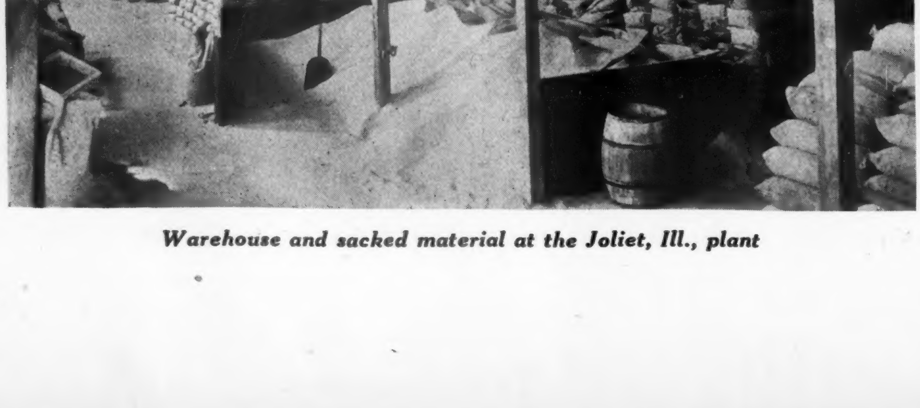
sodium silicate, made the two into a high temperature gasket. The gasket is put into place and when the heat comes into contact with it the mineral swells and completely closes the joint. It is also said that the gasket will not stick to the metal faces of the joint but frees itself quite readily.

Zonolite is said to have lubricating qualities, about on a par with flake graphite. Its factors of cohesion and adhesion are about the same and its melting point is said to be 2600 deg. F. In addition it can be prepared so that it is absolutely free from grit or foreign matter.

The mineral has been found to have the property of coagulating or hardening oils so that it can be used to advantage instead of aluminum stearate. In this connection it will be recalled that where grease is used in a grease cup and the cup is screwed down tight there remains in the cap of the grease cup a pale yellow residue. This residue is said to be mostly the aluminum stearate or other chemical used to harden the oil, and which has little if any lubricating value. It is said that zonolite, when used for this purpose, does the work satisfactorily and is, in addition, a valuable lubricant. When so used the bearing surfaces become coated with the soft, flaky material and approach a true frictionless condition. This use would seem to call for a large tonnage of the material. For such use the zonolite must be water ground to about minus 300 mesh.

### *Much Used with Gypsum*

Large quantities have been used in moving picture studios for sound insulation, in the manufacture of safes, for bake oven insulation and as a fine aggregate in connection with gypsum plaster. In fact, zonolite has become closely allied with the gypsum industry. Its use as a fine aggregate replacing sand for interior plastering purposes is rapidly growing and walls made of such material have good sound insulation properties. The cost of such walls is said to be about 5 c. per sq. yd. greater than when ordinary sand is used, but the additional cost is offset by a marked decrease in weight. On one apartment house job containing 6000 sq. yd. of plaster, zonolite aggregate was said to have reduced the total weight 81 tons. This means that there was 81 tons less weight to be handled by laborers and plasterers and 81 tons less weight in the structure.



*Warehouse and sacked material at the Joliet, Ill., plant*

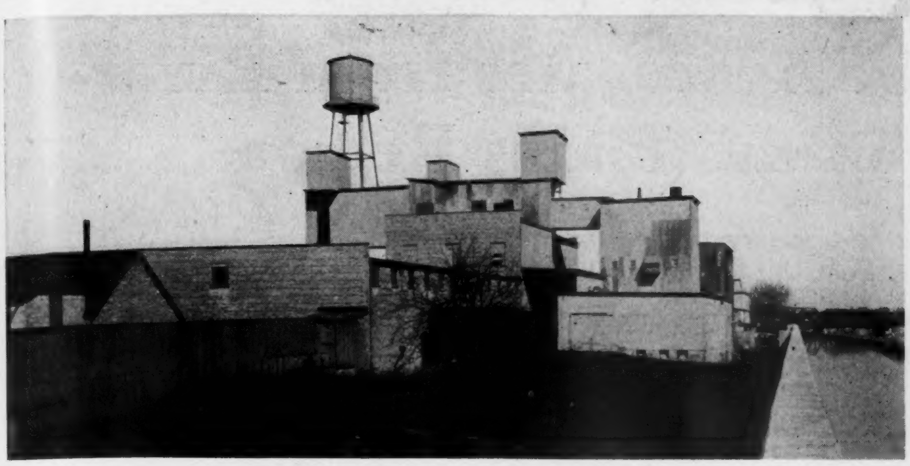
On account of the transportation problem it soon became apparent that the raw mineral would have to be shipped to industrial centers and expanded near the place of use. In 1925 the Zonolite Co. built a large plant at Libby to expand the mineral and the plant is still in existence but the modern trend is towards shipping the raw rock. This would call for a large number of plants throughout the East which, obviously, for the tonnage available per plant, had its disadvantage. So here again the problem is being met in a novel manner.

### *Novel "Expanding" Device*

The idea was to develop a small "expander" which would be leased on a royalty basis. The machine would represent a small investment and its capacity would be in the neighborhood of two tons of zonolite per hour. In working out the design of such a device it was found that heat alone was not all that was necessary to secure a maximum expansion of the mineral. In the rotary type kiln the best expanded material weighed 7 to 9 lb. per cu. ft. on the ½-in. material. On the new type expander, a description of which follows, the mineral has been expanded to weigh as low as 5 lb. per cu. ft. Material of this weight is so light that the direct flame from an oil or gas burner literally blows it out of the furnace.

During the summer of 1931, the Zonolite Products Co. was formed with headquarters at Joliet, Ill., in which the F. E. Schundler Co. took an active part. The problem of expanding zonolite at Joliet was solved by the company's engineers by building an entirely new type of machine which is heated by gas or by electricity. Both types are in operation at the plant of F. E. Schundler and Co. at Joliet.

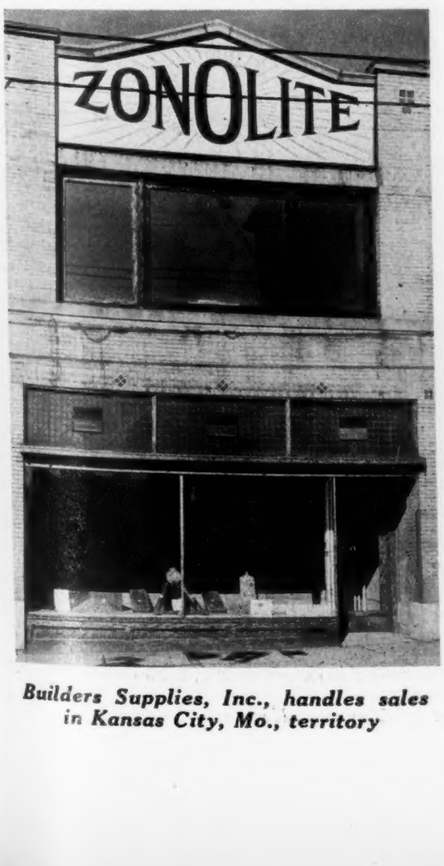
In using the gas or electrically heated machine it was found advantageous to size the crude zonolite before expanding it. This is done by using a "Jigger" vibrating screen that gives three sizes of zonolite: ½-in.,



*Plant of Zonolite Products Co. and F. E. Schundler Co. located on Gulf to Great Lakes waterway at Joliet, Ill.*

⅛-in. and fines. These are expanded separately and almost instantly.

The furnace consists of a machine which is also known as a "Jigger." A vibrating plate 3 ft. wide and 7 ft. long and set at a slight slope is enclosed in a firebrick housing hung independent of the plate. When gas is used as fuel the heat is applied above the vibrating plate through suitable port holes and where electricity is used the electric heating elements are hung about 5 in. above the plate. The sized raw zonolite is fed to the top of the vibrating plate and as it descends is thrown up into the heated zone. In action, each particle of zonolite is repeatedly thrown into the heated zone and this results in a uniformly expanded material at low cost. The machine has a capacity of 4000 lb. per hour and requires a 3-hp. motor to operate the vibrating mechanism. The electric heating elements are rated at 45 kw. and use 220 volt, 3-phase alternating current. They will withstand a temperature of 1800 deg. F. The machine and process are protected by patents and it is proposed to lease the machine on a royalty basis.




*Builders Supplies, Inc., handles sales in Kansas City, Mo., territory*

The Zonolite Products Co. of Joliet, Ill., has the patent rights to this machine and for the sale of zonolite in the territory east of the Mississippi river. F. E. Schundler and Co., at whose plant the present expanders are in operation, conducts a grinding and pulverizing plant of considerable magnitude. The company grinds, pulverizes and sells clays, bentonite, limestone, fuller's earth, talc, magnesite and a wide variety of other mineral compounds. This company handles the sale and expansion of zonolite for the Chicago territory.

The Zonolite Products Co. expects to build a new plant this spring (1932) at Joliet which will adjoin the plant of F. E. Schundler and Co. The plant will provide for the economical handling, calcining and sacking of the finished product.

## Report of the Spanish Cement Commission

THE 1930 ANNUAL REPORT of the Spanish Cement Commission, which regulates the whole cement industry in Spain, is the first of these reports to be issued under the new republican government.

The report mentions the political disturbances which have interfered with the industry, as they have with other things. It says that the commission has been much criticised for prohibiting the enlargement of existing factories and the building of new ones at a time when it permitted the importation of 300,000 metric tons of cement from France and Belgium. But it explains this by showing that when this was done it had already authorized enlargements and new construction which would increase production by 1,100,000 tons, and it considered that this would be ample to care for the growth in the use of cement for some time.

In support of its position it gives the figures of the production and consumption of cement for the years 1928-1930 in some detail. In 1929 the production was 1,608,602 tons and the consumption was 1,799,374 tons, the difference being made up by importations. But in 1930 production and consumption were equal at 1,494,326 tons (about 8,777,000 bbl.). With the authorized enlargements of mills and new mills the Spanish cement industry will have a potential capacity for 2,708,602 tons (about 12,180,000 bbl.) which is practically 50% more than the 1930 consumption.

The commission admits that a serious situation has been created for the industry by a 17% fall in consumption at the same time that factories have been enlarged and built to take care of a 50% increase in production. But such a situation is more or less paralleled in other cement producing countries.

About half the report is given to figures of production and distribution in the different Spanish provinces, and by the different cement manufacturing companies. In addition to the statistics of portland cement, the report notes that 19,669.49 tons of white cement were made and sold by the Griffi company and that 12,006.31 tons of fused aluminous cement were produced and sold by the Molins company.

The existing Spanish cement manufacturing companies and their rated capacities are given in the following table. The capacities are in metric tons of 2204 lb. and may be roughly converted into barrels by multiplying by 6.

| Companies | Tons—rated capacity | Number of kilns |
|---|---|---|
| Cementos Asland de Bilbao, S. A. | 30,000 | 1 rotary |
| Cementos Cosmos S. A. | 110,000 | 2 rotary |
| Cementos Portland de Pamplona, S. A. | 170,000 | 6 rotary |
| Cementos Portland de Lemona, S. A. | 55,000 | 2 rotary |
| Cementos Rezola, S. A. | 110,000 | 7 vertical<br>1 rotary |
| Compañia Anglo-Española de Cementos Portland, S. A. | 60,000 | 2 rotary |
| Compañia General de Asfaltos y Portlands, Asland | 195,000<br>105,000<br>140,000<br>70,000 | 3 rotary<br>3 rotary<br>2 rotary<br>1 rotary |
| Compañia Valenciana de Cementos Portland, S. A. | 95,000 | 6 vertical<br>1 rotary |
| Don Jose Fradera Camps | 230,000 | 4 rotary |
| La Auxilar de Construcción, S. A. | 120,000 | 2 rotary |
| Cementos Portlands Valderrivas, C. M. A. | 100,000 | 2 rotary |
| Sociadad Andaluza de Cementos Portland | 100,000 | 2 rotary |
| Sociadad Española de Cementos Portland | 70,000 | 2 rotary |
| Sociadad Financiera y Minera de Málaga | 100,000 | 4 vertical |
| Cementos Portland Iberia, S. A. | 60,000 | 2 rotary |
| Cementos Tudela-Veguin, S. A. | 90,000 | 5 rotary |
| Cementos Ziurrena | 43,000 | 1 rotary |
| Sociadad General de Cementos Portland de Sestao | 36,000 | 4 vertical |
| Compañia Alicantina de Cementos Portland | 54,000 | 4 vertical |
| Cementos Portland Zaragoza | 60,000 | 2 rotary |
| Cementos Portland de Morata de Jalón, S. A. (in construction) | 27,000 | 1 rotary |
| Cementos y Cales Freixa, S. A. | 27,000 | 2 vertical |
| Plus Ultra Jerezana de Cementos Portland, S. A. (in construction) | 80/90,000 | 1 rotary |
| Materiales Hydráulicos Griffi (white cement) | 30,000 | 1 rotary |
| Cementos Molins, S. A. (fused alumina cement) | 15,000 | |

The capacities are not overrated and some of the mills produced more than the rated capacities in 1929.

# Production of Aggregates from River Gravels in the Plains Region

## Part I—History of the Region and Its Effect on Commercial Problems

By John H. Ruckman
M.S., Assoc. M., A.S.M.E., Topeka, Kan.

THE PRODUCTION of aggregates in the East and in the Ohio river valley has become more or less standardized. There may be some discussion as to the best type of aggregate and the best methods of handling, but the plants producing similar classes of aggregate have a remarkable similarity and their flow sheets are very much alike. However, when one passes into the territory drained by the western tributaries of the Missouri river a totally different condition is found. Aggregates are produced and used which would not be considered farther east; and the entire system of locating plants, and the design and operation of equipment, differ widely from standard practice along the Ohio river and the Great Lakes. These differences are due primarily to physical conditions resulting from the geological history of the district.

### Editors' Note

***WE DOUBT if any study of the sand and gravel deposits of an entire region has been more thoroughly done than is exhibited by this series. It is our hope that it will furnish the example and the inspiration for similar studies in other regions, where it is possible to generalize in a like manner.***

***The author very properly begins with a geological history of the region and a description of the peculiarities of the raw materials as nature left them. He then outlines what is required of them to meet modern specifications.***

***Succeeding articles will describe in detail the processing and the type of operation developed to meet these specifications.***

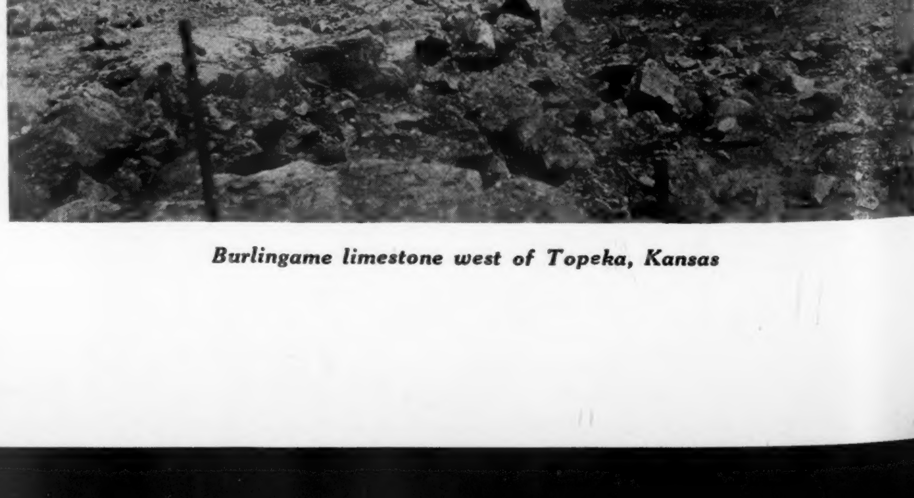
***While the material is different from material developed in other parts of the country in some respects, every sand and gravel operator will find helpful suggestions for solving his own problems; but he will profit most probably by observing how the problems of the industry may be approached and studied and solved in a large way to the advantage of a group of operators.—The Editors.***

### *Geological History*

There are those who predict that by complicated electrical devices we may some day be able to view events which happened many centuries ago. If we possessed such a device and could obtain an image of Kansas in the Ordovician age it would differ markedly from what we see today, for we would behold a number of rugged islands running roughly north and south. The central portion of these islands was made up of pinkish granite flanked by a great belt of limestone, while along the beaches and on the ocean bottom lay a blanket of the clearest white quartz sand, the sand today known to oil men as the Wilcox and to the glass industry as the St. Peter's sand. Today these rocks outcrop in Illinois, eastern Missouri, and southern Oklahoma, and a granite which may or may not be the same forms the heart of the Rocky mountains. Elsewhere they are buried beyond commercially recoverable depths.

During the ages which succeeded the Ordovician era the basins between the ancient granite ridges have been filled. At first the seas which flowed through the area were clear, and hard, massive limestones formed; for example, the Boone, Hertha, Winterset, Drum and Iola limestones of the Kansas City formation and the Plattsburg and Stanton limestones of the Lansing formation, in which are the quarries in western Missouri and eastern Kansas. Sometimes the sea retreated and coal swamps formed. As the era wore on the sea seems to have become constricted and to have evaporated. Vast salt beds were formed in western Kansas and the limestone beds were replaced by gypsum. As a result the later limestones which underlie the central and western portions of the state are generally too soft for use as aggregate, or are found in ledges which are too thin for large scale development. The Burlingame limestone, outcropping just west of Topeka and striking southward and a little east of north, is the most westerly commercial bed, and no large quarries are being operated on it.

After the withdrawal of the sea, Kansas, Nebraska and Oklahoma were above water for many ages, and no limestones formed, nor are there any hard igneous rocks. During the Cretaceous period there was once more a shallow sea in which were laid down muds, fine muddy sands, bentonite, and chalk. One exception occurred during the Dakota time when great volumes of clean hard sand, pebbles and even cobblestones were washed down over the entire district from the Rockies to some point east of Salina, Lincoln and Omaha, the coarsest material settling, naturally, nearest the source in Colorado. Today the Dakota sandstone is exposed as the almost vertical "hog backs" along the mountain front in Colorado and in a belt of rough topography stretching from Great Bend, Kan., beyond Omaha. It is not



*Burlingame limestone west of Topeka, Kansas*

quarried to any great extent, but the sand grains and pebbles from it, rounded and reduced in size, are an important factor in the constitution of post-glacial gravels.

At the close of the Cretaceous period the whole plains region seems to have been almost flat. It is doubtful whether Pikes Peak projected above the general level. With the Tertiary era uplifts occurred and the plains proper began to form as a vast outwash sheet from the newly formed Rocky mountains. As these rose the climate grew gradually drier, so that toward the close it might be called arid. During this period the drainage system of the Rocky mountains was formed and the headwaters of the Colorado, Rio Grande, Arkansas, Platte and Yellowstone rivers began to cut their canyons, but on the dry plains beyond they probably changed courses frequently, slowly building a gently sloping plain down which they traveled in the most convenient manner. Wash from the Rockies in the west, from the Dakota in the center, and the weathering of chert in the eastern limestones finally covered the whole region with a sheet of small rock and gravel, which may have extended across part of the Ozark plateau.

### *Coming of the Glaciers*

Then came a change of climate. It grew colder and moister. The rivers began to cut and find themselves more or less permanent courses, which in most cases were probably straight down the slope as shown in Fig. 1. Their flow, however, was soon interrupted by the Kansan glacier, followed a little later by the Wisconsin ice sheet. The ice crowded down from the northeast, blocking all channels and forming lakes such as Lake Washington and Lake Kaw (Fig. 2), which overflowed to the southward.

Although some geologists who first studied the region believe that the Smoky Hill river had in a previous age broken across its divide to the Arkansas river between Salina and McPherson, it seems very likely that this again occurred when the glaciers blocked the lower valley and a wide sheet of sand and gravel was deposited in this channel. These sands carry water of excellent quality and have been considered as a possible source of supply for the city of Wichita. They cover an area 15 miles wide by 60 miles long, to a depth of some 150 ft., and form the bulk of the commercial sand and gravel deposits along the Little Arkansas river. About the same time finer sands were deposited in and around the borders of the lakes. Along the margins of Lake Kaw some sands are very similar to the famous Albany sands of New York state.

The drainage of the district at the farthest advance of the Kansan sheet was approximately as shown in Fig. 2. The flow of the Arkansas river was impeded by the hard rocks in the Ozark district and it failed to become the master stream; on the contrary, as the glaciers receded, the main flow worked eastward till it was stopped by the glacial morains, east of what is now the Missouri river. The Wisconsin ice sheet later contributed more material to halt the streams at this point, and as a result of all this the present Missouri river became instead the master stream.

### *What the Glaciers Left Behind*

Since the retreat of the ice, perhaps half a million years ago, the streams have gone on cutting. The original smooth outwash sheet of the Rocky mountains has been much dissected, but still exists in the high plains surface. Its pebbles and sands have been ground, polished and reworked in all of the rivers, the large cobbles have been worn to pebbles, and the pebbles to sand. The Dakota has also been worn down and reworked into sands of varying fineness.

The great glacial erratics have in many cases been left lying like huge pink quartzite monuments on the uplands, but the moderate sized pieces are to be found in the bottoms of the rivers against bed rock. Above them lies a deposit of coarse sand and gravel of blue-gray color which has not been extensively dredged except in the Kansas river, where it is the much sought after "blue" gravel. This material is chiefly of glacial origin from nearby till, and as a result the large pieces (over 1½-in. diam.) are seldom well rounded or polished. Many of them are of soft and unsound material (druses, limonite, schists, and shale). For this reason the material commercially dredged is what would elsewhere be classed as rather fine. These deposits are overlaid by the most recent river sands, generally light red (on the Little Arkansas) or buff in color, and generally very fine material.

As a result of all these geological events


*Fig. 1. Probable river flow before glacial period*


*Fig. 2. Probable river flow during glacial period*

we have today several sources of aggregate, including massive hard limestone ledges in eastern Kansas and Oklahoma (chiefly east of Lawrence and Tulsa), beds of angular chert (chiefly in southeastern Kansas) and river gravels, the last named almost the sole material over most of Nebraska, eastern Colorado, Oklahoma and Kansas. Near the Rocky mountains these gravels are fairly coarse, but the larger pebbles become less abundant to the south and east. Gravels at Topeka are finer than those at Sterling, but coarser than those at Kansas City. They are finer than those of the Platte river, but coarser than those of the lower Arkansas.

Two analyses representative of the recent bars in the Kansas river are as follows:

| Screen size | Cumulative per cent. | |
|---|---|---|
| On 3/8-in. | 2 | 2 |
| On 4-mesh | 7 | 8 |
| On 8-mesh | 24 | 26 |
| On 14-mesh | 33 | 54 |
| On 28-mesh | 81 | 83 |
| On 48-mesh | 94 | 95 |
| On 100-mesh | 99 | 99 |
| | 3.40 | 3.67 |

A freak analysis taken from a bar in a channel where the current was exceptionally rapid was:

| Screen size | Cumulative per cent. |
|---|---|
| On 3/8-in. | 2 |
| On 4-mesh | 7 |
| On 8-mesh | 30 |
| On 14-mesh | 78 |
| On 28-mesh | 96 |
| On 48-mesh | 99 |
| On 100-mesh | 100 |
| | 4.12 |

In all of these an undetermined amount of coarse material, largely soft and unsound, was rejected from the grizzly before samples were taken. Farther west, however, hard, well rounded pebbles occur over 2 in. in diameter.

The "blue" gravels in the Kansas river show a somewhat different composition:

| Screen size | Cumulative per cent. |
|---|---|
| On 3/4-in. | 1 |
| On 3/8-in. | 2 |
| On 4-mesh | 8 |
| On 8-mesh | 33 |
| On 14-mesh | 60 |
| On 28-mesh | 80 |
| On 48-mesh | 93 |
| On 100-mesh | 99 |
| | 3.76 |

Comparing two rather typical sands from the recent bars and the ancient gravels, we have:

| Screen size | Recent gravels Non-cumulative per cent. | Blue gravel Non-cumulative per cent. |
|---|---|---|
| On 3/4-in. | 0 | 1 |
| 3/4- to 3/8-in. | 2 | 1.67 |
| 3/8-in. to 4-mesh | 6 | 6.83 |
| 4- to 8-mesh | 18 | 22.5 |
| 8- to 14-mesh | 20 | 32.0 |
| 14- to 28-mesh | 37 | 16.6 |
| 28- to 48-mesh | 12 | 12.4 |
| 48- to 100-mesh | 4 | 6.0 |
| 100-mesh | 1 | 1.0 |
| | 100 | 100.00 |

The most notable difference lies in the fact that the recent bars run somewhat finer and have a notable excess of material through 14- and on 28-mesh and a deficiency of material on 14-mesh.

### *What Specifications Require*

Due to the fact that there are few large centers of population in the area under discussion, the products must be judged by their ability to meet state highway specifications. It may be stated at this point that the high chert gravels have not proven successful as coarse aggregate. These gravels seem to be partially residual and have been little worn or worked by water. As a result there are many minute cracks and planes of weakness, and concrete made from this material generally gives poor results under the freezing test.

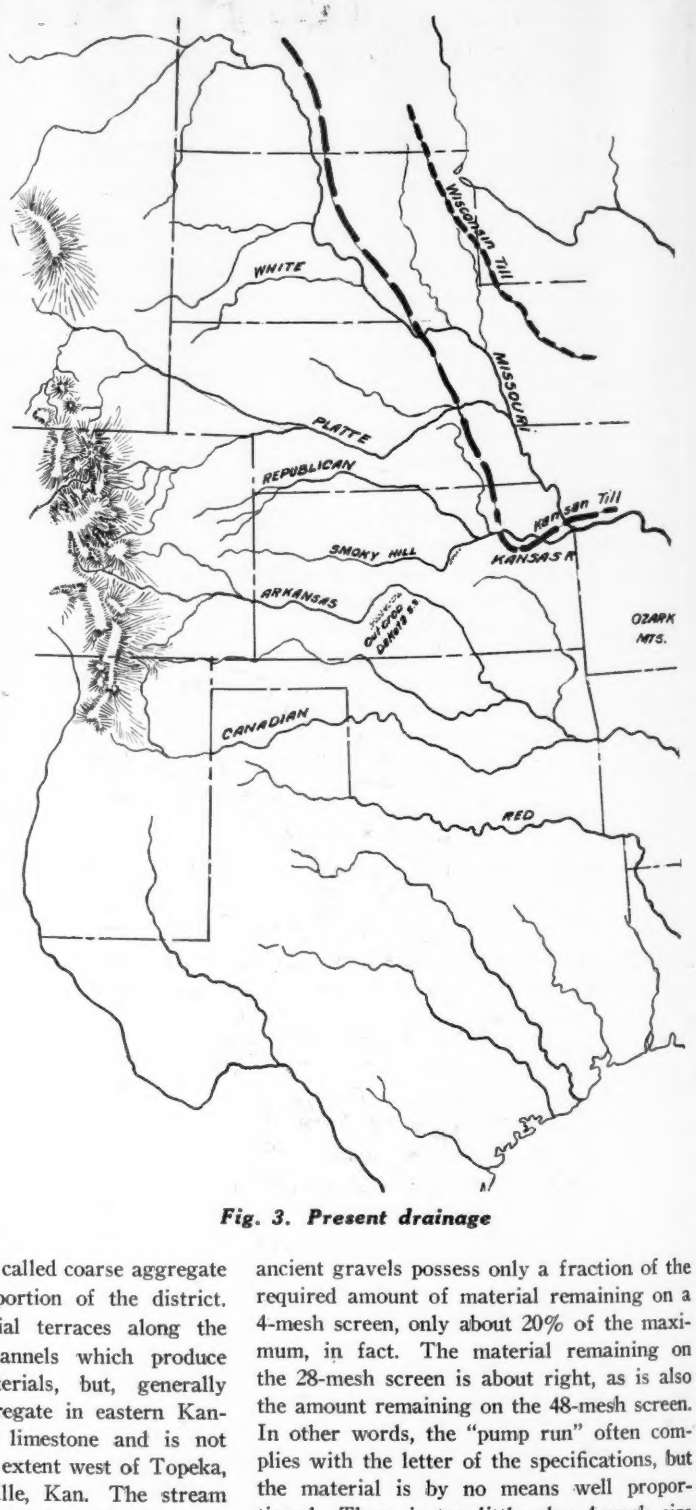



*Fig. 3. Present drainage*

As just shown, stream gravels produce little that can be called coarse aggregate in the southeastern portion of the district. There are few glacial terraces along the sides of the old channels which produce coarse rounded materials, but, generally speaking, coarse aggregate in eastern Kansas or Oklahoma is limestone and is not quarried to any great extent west of Topeka, Omaha, and Coffeyville, Kan. The stream gravels furnish material for mixed aggregate, road gravel, fine aggregate and various sands. Farther west, however, stream gravels produce material which can be used as coarse aggregate.

The Kansas state highway commission today specifies that mixed aggregate shall have the following gradation:

| | For structures | For pavements |
|---|---|---|
| On 1½-in. | 0% | 0% |
| On 4-mesh | 40% or less | 40% or less |
| On 28-mesh | 85% or less | 85% or less |
| On 48-mesh | 97% or less | |
| Gradation factor | 3.30 | 3.30 |

It is at once evident that both present and ancient gravels possess only a fraction of the required amount of material remaining on a 4-mesh screen, only about 20% of the maximum, in fact. The material remaining on the 28-mesh screen is about right, as is also the amount remaining on the 48-mesh screen. In other words, the "pump run" often complies with the letter of the specifications, but the material is by no means well proportioned. There is too little plus 4-mesh size and vastly too much minus 4-mesh plus 28-mesh.

For road gravel the gradation demanded is:

| | |
|---|---|
| On 1-in. | 0% |
| On 3/4-in., not more than | 5% |
| Gradation factor | 4.00 or 4.25 |

Not to exceed 5% soft and friable.

Here it will be noted that while an occasional freak bar or lens may have the necessary factor, very little pump run material is coarse enough. Again the over-abundance of through 4-mesh (and especially through 6-mesh and on 28-mesh) is apparent.

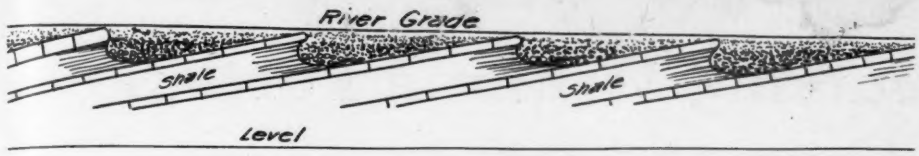



***Fig. 4. Longitudinal section showing outcrops below channel of lower Kansas river***

For blotter treatment the requirements are:

| | |
|---|---|
| On ¾-in. | 0% |
| On 14-mesh | 30 to 60% |
| On 200 | Not less than 85% |

There is no trouble as to the last requirement so far as sand is concerned. On the contrary, it is hard to get enough material passing 48-mesh to satisfy the contractors. Keeping the plus 14-mesh minus 60-mesh is, however, not so easy, particularly if a reasonable amount of coarse material is included. Again the excess of material between 6- and 14-mesh makes trouble.

Finally, for fine aggregate, the requirements are:

| | |
|---|---|
| On ⅜-in. | 0% |
| On 4-mesh | 15% or less |
| On 28-mesh | 70% or less |
| On 48-mesh | 95% or less |

Gradation factor—2.4 to 3.8.

It will be noted that the fines present are about equal to those in the river run. If the 8% plus 4-mesh is screened out, however, the material on 28-mesh will tend to become about 80% instead of 70%, and if an attempt is made to lower it the gradation factor will suffer.

### *Accurate Gradation an Increasing Problem*

Summarizing, in almost every case there is a deficiency of material of the plus 4-mesh grade, and no surplus of through 48-mesh, while there is too much 4- to 48-mesh and especially too much 14- to 48-mesh. Obviously, the coarser material can be combined with some of the finer to make mixed aggregate and road gravel, and obviously some of the finer can be used for fine aggregate. In the past the surplus "middlings" have been absorbed in other products, but this practice cannot last much longer. If the water-cement ratio has done nothing else it has taught engineers and contractors alike to insist on minimum voids. Ready-mixed concrete plants are particularly keen on this point and will not tolerate an excess of an undesirable size. In a short time accurate gradation will be obligatory.

The same conditions exist in other districts in the Rocky mountain drainage area. The writer recently met two equipment representatives who had just encountered the same problem at the Hoover dam. The same problem in a different form has long bothered producers in Texas, where pea gravel is present in over-abundance. It occurs elsewhere relative to different sizes.

The peculiar feature in the Plains Region is the size of the particles to be separated. The closest classification lies between the 14- and 48-mesh screens, well below the point at which trommels or even vibrating screens (wet) are effective. The great problem in the treatment of the plains deposits is to remove a certain amount of moderately fine material by hydraulic classification and at the same time save all material passing the 48-mesh, but remaining on the 100-mesh test screen. As a result of these requirements many of the accepted methods of treatment have proven inapplicable and the operators have been forced to develop systems of their own. These have at first been crude, but with increased experience they are becoming more accurate, and there is being evolved a type of plant differing radically from that which has been regarded as standard.

### *Peculiarities of River Beds*

Another problem, resulting from past geological events, is the condition of the river channels. During the period following the retreat of the glaciers all the streams in the region cut to bed rock. Toward the west the bed rock is soft and smooth and wide valleys were opened. Toward the east the Carboniferous limestone beds rising slightly to the east as the river grades fall caused rapids and waterfalls. Later the basins between these ledges filled with gravel and sand.

Due to the development of the Missouri river and the fact that the Kansas river is able to draw water from both the Platte and the Arkansas rivers through the ancient river gravels, the valleys of the last named streams have practically filled with sand and fine gravels, a very appreciable quantity of water passing downstream as "underflow." The Cimmaron and Canadian rivers have also been unable to carry their load and today are filled with fine sand, the surface of which is often damp and along which many shallow streams of water find their way.

This does not mean, as many suppose, that these rivers are only "a foot deep." The sand filling the channel is an unstable quicksand, quite similar to the material discharged from the average cone classifier. Engineers of one of the railroads recently got a sounding in the Cimmaron river of 126 ft. in this material using 4 ft. of 125-lb. rail as a sinker. The movement of the material was so rapid that they could not withdraw the rail, and when they secured the wire by which it was held to the bridge from which they were sounding, the wire parted.

The sands underlying the Platte and Arkansas rivers are more or less similar, but are coarser, and, since there is normally little movement of the water, they are generally more stable.

The Kansas river is a little different. Because of its steady and relatively heavy flow of water it has kept its channel cut down to the limestone ledges, which outcrop at various points, notably Valencia, Tecumseh and Argentine.* Between these outcrops are great basins of sand, often 80 ft. in depth. The river flows chiefly in a well defined channel, but the sands immediately underlying this channel are as unstable as those in the Cimmaron river. The writer has seen a barge, drawing 1 ft. of water, hard aground at a point where a common pike pole could be shoved down 12 ft. without hitting anything solid enough to push against.

### *Require Extremely Shallow-Draft Floating Equipment*

These conditions place a tremendous premium on shallow draft equipment. A boat drawing 3 ft. is absolutely useless except in artificial ponds excavated outside the river channel. Boats drawing 2 ft. are frequently aground, and when a given bar has been pumped out a new location cannot be chosen till the next high water. A boat drawing 12 in. was recently built and found an improvement on previous equipment, but there is a demand for boats and pontoons of still lighter draft.

It will be seen that aggregate production in this region has some unique features. Near the Missouri river hard limestones furnish the bulk of the coarse aggregate, and in a limited district chert is used as road gravel. Over the remainder of the district there is available for all purposes no material other than river gravels, recent or ancient. This has freed the gravel operator from outside competition, but has imposed the responsibility of producing substitutes for products ordinarily developed from much coarser material.* Physical conditions have made the operator depend almost exclusively on water as a means of excavation and classification. The depth of water at the point of excavation and the size of particle to be classified have forced the development of new methods. Up to the present these methods, while crude, have been satisfactory and have entailed little outlay of capital. Steadily increasing demands for more exact gradation and for gradations of a more difficult type are forcing operators to adopt new methods which in many cases involve the development and design of completely new flow sheets, plant layouts and equipment.

*(To be continued)*

## Plan Program for Materials Handling Institute

A MEETING of the board of governors of the Materials Handling Institute was held in Detroit, Mich., April 4. Plans and program for the meeting to be held May 5 were discussed and decided upon.

*One railroad, the Union Pacific, uses granite from the Rocky mountains for ballast, in spite of the long haul.

# Changes Occurring Within a Portland Cement Kiln*

By William N. Lacey and Howard E. Shirley

California Institute of Technology, Pasadena, Calif.

### Abstract

***A METHOD of following changes in the combination of lime has been applied to samples from an operating dry-process rotary portland cement kiln, under the conditions prevailing during a 5-hour period.***

***The well-dried charge lost its combined water rapidly in the first 30 ft. of the 102-ft. kiln. The decomposition of $CaCO_3$ began to be appreciable 15 ft. from the feed end of the kiln and proceeded steadily until completed at about 20 ft. from the discharge end. Recombination of the CaO freed from $CaCO_3$ did not begin actively until the charge was nearly half way through the kiln and was not completed until within 10 ft. of the discharge end. The specific gravity of the charge increased at a rate corresponding roughly to the evolution of $CO_2$.***

A METHOD of obtaining samples of the charge at a number of points along the length of an operating rotary cement kiln has been described by Lacey and Woods.† They showed curves portraying the changes in the kiln charge as it passed through the kiln. These changes were followed by means of analyses of the samples for loss on ignition and for free lime (uncombined CaO). The former determination gave indication of the progressive loss of volatile matter, while the latter showed the excess of CaO freed by calcination over that which had recombined with the other nonvolatile constituents of the charge at any particular stage of the process.

It is the object of the present authors to report an extension of this method of treatment, capable of giving a more complete account of the changes occurring. The results of analyses of a similar set of samples obtained from the same kiln that gave rise to the samples studied by the above authors are presented by way of illustration. By analyzing separately for water and for $CO_2$ as well as for the total loss on ignition and for free lime, it becomes possible to follow directly changes in the state of combination of the lime.

### Sampling

The kiln sampled was at the Crestmore plant of the Riverside Cement Co. near Riverside, Calif. The plant was handling a dry raw mix containing a small percentage of returned dust. The fuel was natural gas, and the gases leaving the feed end of the kiln passed through waste-heat boilers. The dimensions of the kiln and positions of the sampling stations were the same as those given by Lacey and Woods. They are shown again here, for convenience in Fig. 1.

Samples of feed, of clinker, and of charge at twelve different stations (indicated by numbers along the kiln axis in Fig. 1) were taken nearly simultaneously at half-hour intervals. All the individual samples for a given location were composited in a large tin can with tightly fitting cover. The period of continuous sampling extended over 5 hours. After the run the sample-can covers were sealed with paraffin until the samples were removed for grinding. After being ground to pass a 60-mesh screen, each sample was well mixed, quartered, and one quarter placed in a small tin sample can with a tight cover. Each of these cans, together with the remaining three-quarters of the sample, was returned to the larger sample can which was then resealed with paraffin. After a sample for analysis was withdrawn from the small can, the latter was again returned to the large can which was then resealed. These precautions were found necessary on account of the hygroscopic nature of the samples, particularly those showing high free-lime content.

### Analytical Methods

The determinations of water, $CO_2$, and loss on ignition were made by heating a weighed sample in a boat inserted in a silica tube and sweeping the evolved gas and water vapor into weighed absorption bottles. The gas used for sweeping was passed through a preliminary purifying train before entering the silica tube.

The purifying train consisted of bubble counter, trap, $CaCl_2$ tower, soda lime tower, desicchlora tube, ascarite tube, desicchlora tower, ascarite tower, large dry bottle, and U-type weighing tube for checking the effectiveness of the purification train. The large dry bottle served as a reservoir to store a quantity of purified gas which could be drawn upon for sweeping purposes. Frequent checks upon this system showed that, if the tubes were occasionally shaken to prevent channeling, no corrections were necessary for water or $CO_2$ entering with the purified gas.

The silica tube was ⅞ in. inside diameter and 1⅛ in. outside diameter. A zone 9 in. long was heated in a small furnace by three Fisher burners, using a natural gas-air mixture. The heated portion of the tube was protected from direct contact with the flame by a closely fitting shield of sheet nickel. However, in spite of this protection, the silica slowly devitrified, lasting for six months of continuous use. The entrance end of the silica tube was connected to the purifying train by a long rubber stopper, one end of this fitting the end of the tube, the other end fitting into a piece of large rubber tubing which was taped around the outside of the silica tube. This gave a satisfactory gas-tight joint. It was determined that the temperature of the inside surface of the stopper did not go above 40 deg. C. as a result of heat radiated from the interior of the tube.

The exit end of the silica tube was drawn down, and a smaller piece of clear quartz tubing was sealed to it. The end of this tube was ground to fit roughly into a flare on the end of one side arm of the first Fisher ab-

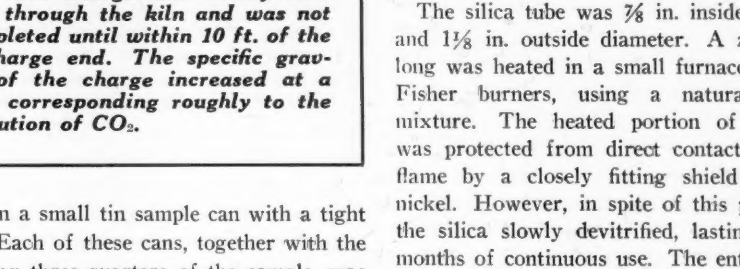



*Fig. 1. Locations for sampling kiln change*

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*Reprinted by permission from *Industrial and Engineering Chemistry*, March, 1932.

†*Industrial and Engineering Chemistry* (1929) 21, and ROCK PRODUCTS, January 18, 1930.

sorption bottle. This junction was made gas-tight by using a piece of pure gum-rubber tubing over it.

The absorption train consisted of four Fisher absorption bottles followed by a trap, a bubble counter, and an aspirator bottle to pull gas through the system. The first two absorption bottles were filled with desicchlora (anhydrous barium perchlorate) to absorb water driven from the sample for weighing. The third and fourth absorbers contained ascarite (asbestos impregnated with NaOH) for absorbing $CO_2$, and also some desicchlora to prevent loss of moisture from ascarite. The temperature of the gases coming from the exit end of the silica tube was found to be about 38 deg. C. for the rate of approximately 2 liters per hour used in the determinations. Since this is safely below the decomposition temperature of the hydrate of barium perchlorate (120 deg. C.), no difficulties were experienced from this source.

The method used in making a determination was as follows: The Fisher absorbers were carefully wiped with a clean, dry, lintless towel and weighed. They were then inserted in the ignition train. A sample of the material to be analyzed was weighed into an alundum boat which had been previously ignited and weighed. The boat and sample were pushed into place in the heating zone of the silica tube by means of a long wire. The end of the silica tube was closed up again, stopcocks were opened, and the aspirator adjusted so that air was pulled through the train at the rate of approximately 2 liters per hour. A vacuum of 15 mm. of mercury was necessary to accomplish this. The heating zone of the silica tube was then brought up to 1000 deg. C. during the course of an hour. The temperature was measured with a chromel-alumel thermo-couple. It was found that 4 hours were necessary for the $CO_2$ to be completely liberated and swept out of the tube. At the end of this period, the aspiration was stopped, and the absorbers were allowed to come to atmospheric pressure, removed from the train, and reweighed to ascertain the amount of water and $CO_2$ evolved. The boat was allowed to cool in the silica tube, the purification train protecting it from

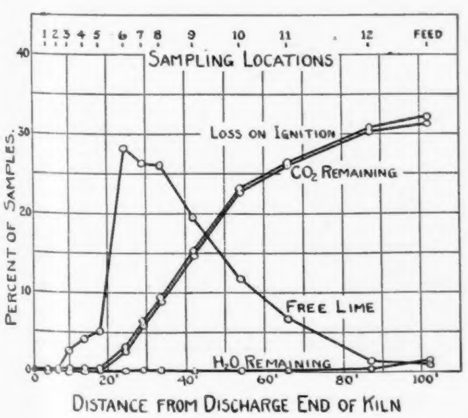



*Fig. 2. Results of analyses*

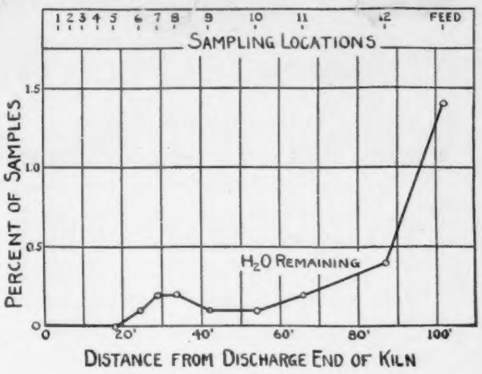



*Fig. 3. Water evolved*

water or $CO_2$ meanwhile. The loss in weight of the boat and sample was determined and reported as the loss on ignition.

The free-lime determinations were made by the method of ammonium acetate in absolute alcohol, used by Lacey and Woods (1). Specific gravities were determined with a standard Le Chatelier specific-gravity bottle. The $MgCO_3$ present in the feed was determined by a method described by Meade. The mean of several determinations gave a value of 3.9% $MgCO_3$ in the feed, corresponding to 1.9% $CO_2$ obtainable from this source. In the calculation of CaO liberated from $CaCO_3$, this amount of $CO_2$ has been taken into account as coming from $MgCO_3$ before any $CaCO_3$ has decomposed. Since the amount of $MgCO_3$ present is small compared to the $CaCO_3$ and on account of the much greater tendency of $MgCO_3$ to decompose at moderately high temperatures, this assumption involves only a small error in the calculations. The free moisture in the feed was determined by holding a sample at 105 deg. C. for 5 days, which showed a loss of only 0.09%. The anaylsis of the clinker was as follows: 64.3% CaO, 3.8% MgO, 23.1% $SiO_2$, 4.6% $Al_2O_3$, 2.2% $Fe_2O_3$.

The results of the analyses are given graphically in Fig. 2, which shows changes in the charge in relation to its distance from the discharge end of the kiln. Since the water evolved is small, a plot on enlarged scale is shown in Fig. 3. Checks to the nearest 0.1% were obtained on all values of loss on ignition, water remaining, and $CO_2$ remaining which are reported. The check specific-gravity determinations agreed to 0.003.

### *Discussion of Analyses*

It was found that the values for loss on ignition and for $CO_2$ evolved are in close agreement throughout. This would be expected to be true after most of the water in the charge had been driven off, but is surprising for samples at and near the feed end of the kiln. A comparison between the loss on ignition and the sum of the water and $CO_2$ evolved indicates that the loss on ignition of the feed sample is distinctly low. A possible explanation of this discrepancy is offered by the absorption by the feed of oxygen from the air used for sweeping the gases from the silica tube. To test this hypothesis, four determinations were made, replacing the air with nitrogen from a cylinder. The results are given in Table I. The second column shows ignition-loss values determined in previous analyses using air in the tube.

TABLE I. ANALYSES OF SAMPLES

| Sample | Ignition loss: In air % | Ignition loss: In nitrogen % | $CO_2$ % | $H_2O$ % | Difference between loss and $CO_2$+$H_2O$ |
|---|---|---|---|---|---|
| Feed | 31.7 | 32.2 | 31.3 | 1.1 | —0.2 |
| Feed | 31.8 | 32.2 | 31.2 | 1.2 | —0.2 |
| 8 | 9.4 | 9.3 | 8.9 | 0.2 | 0.2 |
| 8 | 9.4 | 9.2 | 8.8 | 0.2 | 0.2 |

It will be seen that the use of nitrogen results in a higher value of ignition loss and a lower discrepancy in the case of the feed. This smaller discrepancy might be explained by the fact that the nitrogen was produced from liquid air and was not purified from oxygen before use. No great difference was found for the sample from station 8 whether air or nitrogen was used. The higher value for loss on igntion of the feed has been used in Fig. 2 and subsequent calculations.

A series of determinations of loss on ignition was made by the usual method to study the rate of loss of weight. The rates for three samples are shown in Fig. 4, the total loss at the end of 4½ hours being called in each case 100% to allow an easier comparison. It will be seen that the samples vary in the rapidity with which volatile matter is given off. Two samples had evidently not reached constant weight at the end of 4½ hours. Twelve hours of continuous igniting of four samples resulted in greater losses than those found in 4 hours in the furnace tube, as shown in Table II.

TABLE II. DATA ON IGNITION LOSS

| Sample | Loss on ignition (Per cent. of original sample) 4 hr. in tube | 12 hr. in crucible |
|---|---|---|
| 12 | 30.7 | 31.2 |
| 10 | 23.1 | 23.5 |
| 8 | 9.4 | 9.9 |
| 6 | 3.2 | 4.1 |

The fairly constant increase in loss during the last 8 hours might indicate a gradual volatilization of alkalies. This gradual increase in loss on ignition makes it very difficult to know when to stop the process

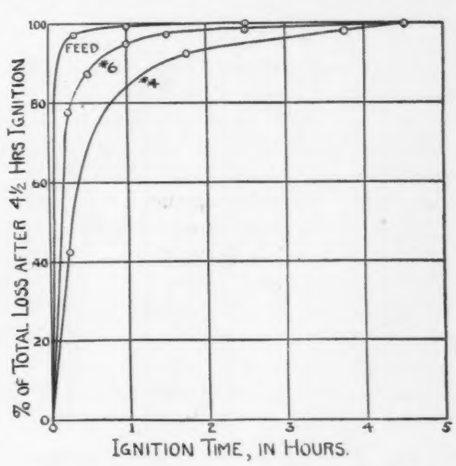



*Fig. 4. Rate of loss during ignition*

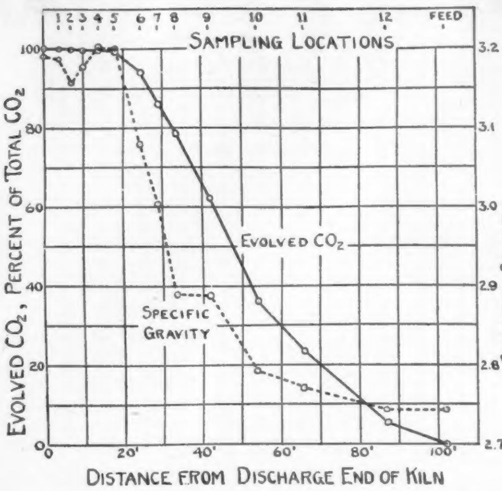



***Fig. 6. Relation between increase of specific gravity and $CO_2$ evolution***

when highly accurate results are desired.

Fig. 3 shows that the combined water was driven out of the charge rapidly. Only 0.1% of the water was free moisture, removable by drying at 105 deg. C.

The slight increase in water remaining in the samples from stations 7 and 8, although not large enough to be much beyond experimental accuracy, might be attributed to the great tendency of samples from this section of the kiln to absorb moisture. This tendency is shown in Table III, the samples of which were stored in tin cans which were tightly covered but not sealed with paraffin. A similar set of samples, taken from stations adjacent to No. 7 and stored for a year, showed moisture values of about 9% while the feed gave only 1.5%.

TABLE III. TENDENCY OF SAMPLES TO ABSORB MOISTURE

| Sample | Loss on ignition: Initial % | Loss on ignition: 4 months later % | Loss on ignition: Difference % | Free lime content % |
|---|---|---|---|---|
| Feed | 31.8 | 31.7 | —0.1 | 0.9 |
| 10 | 23.1 | 23.4 | 0.3 | 11.7 |
| 9 | 15.4 | 17.2 | 1.8 | 19.6 |
| 8 | 9.4 | 12.0 | 2.6 | 26.1 |
| 7 | 6.4 | 10.3 | 3.9 | 26.3 |
| 6 | 3.2 | 8.2 | 5.0 | 28.2 |
| 4 | 0.3 | 1.7 | 1.4 | 4.2 |
| 2 | 0.3 | 0.4 | 0.1 | 0.3 |
| Clinker | 0.1 | 0.6 | 0.5 | 0.1 |

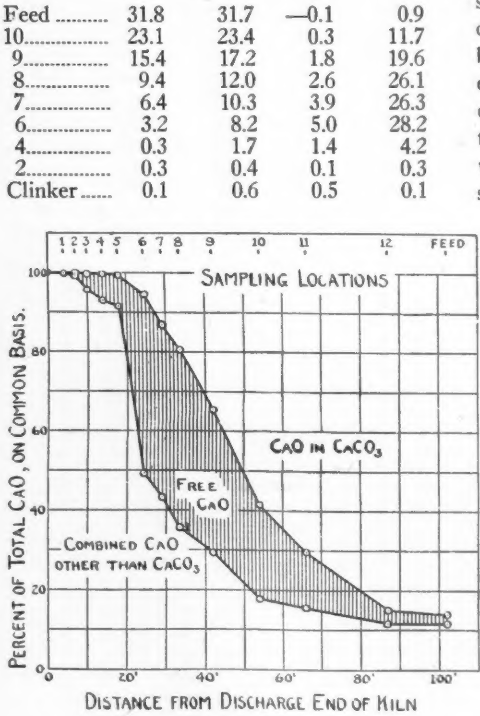



***Fig. 5. State of combination of CaO at various points***

***Discussion of Results***

Before considering the changes occurring in the charge as it passes through the kiln, it is necessary to bring the analytical results to some common basis for comparison. It has been assumed that the nonvolatile material (that is, 100% minus the per cent. loss on ignition) passes through the kiln without loss or gain in weight. This involves the assumption that the material volatilized by igniting the feed in a crucible is the same in amount as that volatilized by a partial ignition in the kiln followed by a final ignition in the crucible. This constant amount of nonvolatile material then serves as a "tracer" to assist in the determination of the amounts of the samples taken at different stations which correspond to a given-size sample of original feed. Such calculations have been made on a basis of a sample of 100 lb. of feed, and the amounts of certain constituents present at various stages of the process found. In these calculations the loss on ignition of the feed has been taken as 32.2%, which is the value obtained by ignition in an atmosphere of nitrogen, as described above. The initial free lime plus all the CaO liberated from $CaCO_3$ during the process is less than the total CaO present, the difference representing CaO which was originally in combination with other acidic constituents than $CO_2$.

Fig. 5 shows three fields indicating the state of combination of the CaO in the kiln charge at various points in the kiln. It will be noted that $CaCO_3$ persisted in appreciable quantity to within 20 ft. of the discharge end of the kiln. Free lime was not reduced to a satisfactory value until the clinker was within 10 ft. of the discharge end. Only small amounts of lime were recombined while the charge was in the uuper half of the kiln. The most rapid recombination of lime occurred near the 20-ft. point where the last of the $CO_2$ disappeared from the charge. The last of the lime recombination was a comparatively slow process.

The data presented in Fig. 6 show that, although no strict correlation exists, the increase in specific gravity of the charge follows in a general way the evolution of $CO_2$ from the charge. The decided drop in the specific-gravity curve at stations 3 and 2 might be explained by the presence of $\beta$-dicalcium silicate which changed, upon premature removal from the kiln, into the $\gamma$ form which has about 10% greater volume. There is no direct evidence in favor of this explanation, and it is merely suggested as a possible way of accounting for the phenomenon.

## Effect of Gypsum on Soundness of High-Limed Cement Clinker

THE results of soundness tests by the Heintzel ignited sphere test and the Prussing compressed-pot kiln test are given in an article by Dr. O. Goffin and G. Mussgnug in *Cement and Cement Manufacture*, December, 1931.

These tests, which are much more sensitive than the usual soundness tests, indicated that a slight tendency to expansion can be eliminated, in the case of the clinker tested, by the addition of gypsum up to the limiting value of 3% allowed by standard specifications. They also indicated that the limiting values of lime content given by the formulæ of Guttmann and Kuhl (lime modulus of 3 and lime saturation factor of 1) cannot be exceeded without danger of expansion, even with the most favorable raw materials and manufacturing conditions. Diluting the ground clinker with up to 6% of finely ground limestone and with sand showed no effect on soundness. Anhydrite had the same effect as gypsum.

## Reports on Sugar in Mortar

MUCH PUBLICITY has recently been received by a paper presented before the sugar division of the American Chemical Society at its meeting in New Orleans, March 29. In this paper Drs. G. J. Cox and John Metschl, of Mellon Institute of Industrial Research, Pittsburgh, Penn., have discussed their current investigations of the value of cane sugar in strengthening lime-sand mortar. Such an application of sugar is not new, these men pointed out, as it is believed that the Romans made use of saccharine materials in mortars that have stood the test of time. Also, in sugar-growing countries, it is known that sugar has been employed to increase the strength of mortar, they said.

Drs. Cox and Metschl have found that there is good reason for the empirical practice of "sweetening" mortar. From their experiments they have ascertained that mortar which contains sugar equal to 6% of the quick-lime content has a tensile strength 60% greater than that of mortar containing no sugar. Further tests are planned of compression strength, setting time and durability as influenced by cane sugar.

In mixing the sugar with the mortar the sugar is dissolved in part of the gaging water and mixed in with the sand and lime. The sugar must not be mixed with the lime before slaking.

## Mica in 1930

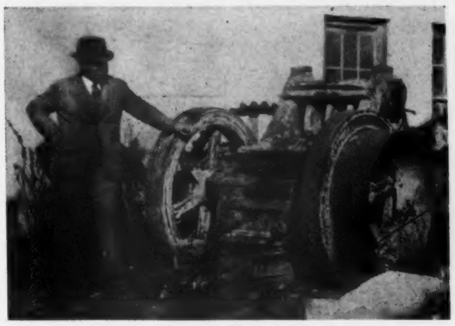
THE Bureau of Mines has issued a bulletin on mica, its production, uses and distribution.

# New England Crushed Stone Operation Kept Up to Date

## West Roxbury Trap Rock Co. in Boston, Mass., District, Through Successive Improvements, Has Kept Plant Modernized

***General view of plant of West Roxbury Trap Rock Co.***

THE CRUSHING OF STONE in the New England states is an old industry. It could almost be called the cradle of America's crushed stone industry and as the years have multiplied most of the operators have learned the meaning of economic operation and distribution. They have learned that their industry is one that is constantly changing, that what was a cheaply produced product yesterday is costly today and that what was considered a high quality material a few short years ago is not what the buyer wants today. Most of the plants are old in years and carry the scars of time, and were judgment to be passed from casual inspections the decision probably would be unfavorable. But when we dig down into the facts, get behind and into the real operation, it will be found that these New England plants are producing stone as cheaply or cheaper than some of the well dressed and much newer plants in neighboring states.



***Bernard McKinney, general manager, standing beside the old jaw crusher***

The West Roxbury Trap Rock Co., West Roxbury, Mass., some 10 miles south of Boston, is an old operation. Bernard A. McKinney, general manager, has been there over a quarter of a century, but even he could not tell how old the operation was before he took charge. At the time he took charge a 10-in. by 18-in. Climax jaw crusher was the primary unit; and it was considered a big day's run when 125 tons were crushed. But each year some change was made, a new crusher here, a new screen or a new method of screening there, changes in quarry loading, changes in quarry transportation, until today the operation has a capacity of 2200 tons per 9-hour day and produces a well graded and clean product that meets all specifications.

In the Boston metropolitan area the aggregates used are sand, gravel and trap rock. There is little if any limestone available. Specifications for trap rock call for a French coefficient of hardness of 12 and a coefficient of toughness of 14. Hence the cost of crushing and handling this stone is more than for crushing limestone or dolomite.

At the West Roxbury operation a small amount of stripping is removed with a 1-yd. Erie steam shovel loading to trucks. Drilling is done with three Gilman and one Chicago Pneumatic tripod mounted water drills. Jackhammers are used for the small amount of secondary shooting necessary. Holes 3 in. in diameter and 20 ft. deep are shot as

***Crushing plant at right and screening plant at left***

*Office on the site of earlier plant*

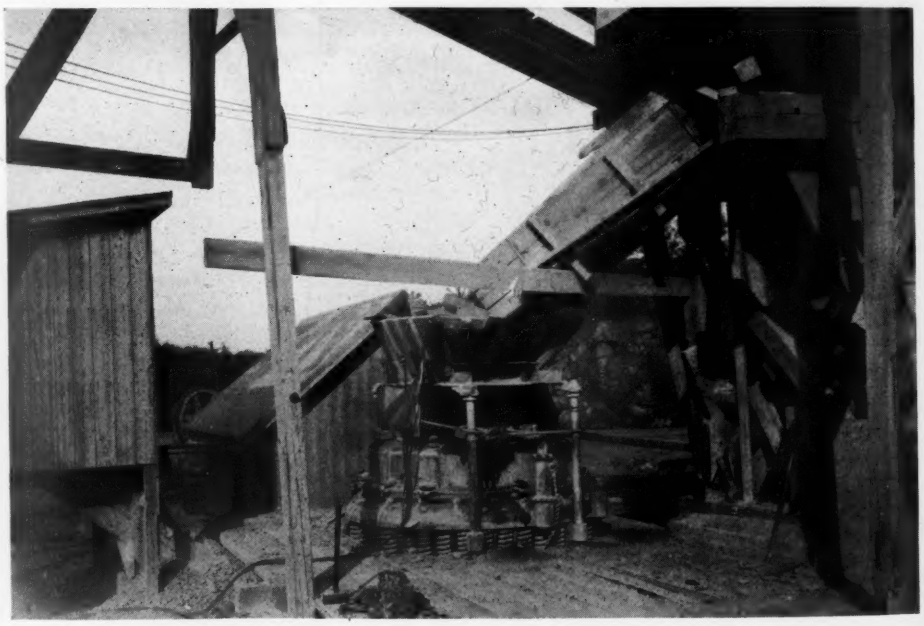
*Truck loading at "bottom" stone plant*

necessary and only a few at a time on account of nearness to highways and residences. The Massachusetts laws regulating size of quarry blasts are stringent. Air for drilling is supplied by a 1100-cu. ft. per min. Chicago Pneumatic compressor. Ingersoll-Rand drill sharpeners are used.

The outstanding feature of the entire operation, and one which is quite uncommon in New England practice, is that after the stone passes the 42- by 60-in. Farrel-Bacon primary jaw crusher it is scalped over a 4-ft. by 6-ft. Niagara vibrating screen. Two products are made by this screen, a 2½-in. to 6-in. stone which is free from quarry fines and a product (minus 2½-in.) containing the quarry fines. About 40% of the total primary crusher output is minus 2½-in. stone and 60% plus 2½-in. stone. The two products go to separate plants and are treated separately. By this arrangement two broad classes of material are produced; one from the plant treating the fines and another from the plant handling the oversize from the scalping operation. This latter material, then, is a product which at all times is a clean, high class aggregate ranging from the top size to dust and is a 100% trap rock product.

As both products are used mainly for bituminous road construction the two plants have been called the "top stone plant" and the "bottom stone plant." The oversize from the primary jaw crusher is treated in the "top stone" plant and the fines from the scalper in the "bottom stone" plant.

Thus when cleanliness of stone or accuracy of sizing is considered the operation can produce any grade of stone that the market requires. All these changes in the way of lowering production costs and making a more marketable product did not come at once but were an outgrowth of watching the demand and changing the plant so as to more than meet those demands. In fact this change from straight crushing and screening practice was made in 1927 and from that time up to this year some major change or addition was made to maintain the advantages of good material and economical operation. For instance the same year that this method of scalping and screening was adopted the rotary screens in the scalping plant were replaced with vibrating screens. Belt conveyors and a bucket elevator were installed to carry out this idea. In the same year trucks were installed in the quarry to replace the older industrial haulage system and the present primary jaw crusher was installed. There are now



*Cone crusher used for recrushing*

*General view of quarry face*

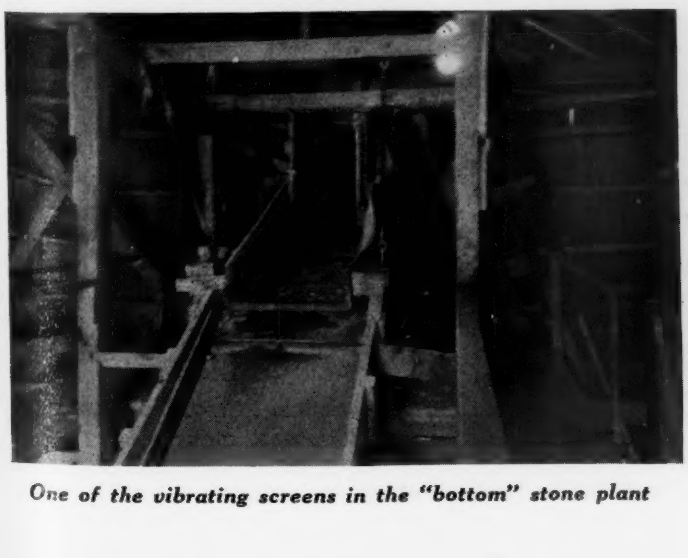
*Tripod drills on one of the benches*

*Electric shovel loading to truck*

five Mack trucks in the quarry each equipped with 8-ton capacity Easton type bodies. The change proved beneficial and so another progressive step was taken; the three secondary jaw crushers were replaced with a 5½-ft. Symons cone crusher and more vibrating screens added. Previously a 24x36-in. jaw crusher and two 14 by 18-in. jaw crushers had been used for this work. For the quarry a modern 50-B 2-yd. Bucyrus-Erie electric shovel was purchased. In that year there came a change in the market requirements for certain sizes of stone. The market for the intermediate sizes between 2-in. and ½-in. dropped alarmingly with a corresponding increase in the demand for 2-in. stone and for "pea" sizes of trap rock, especially the smaller size. This demand came from the extensive program of top dressing the older bituminous roads. This change in demand was immediately met by a change in the crushing practice through the installation of a 3-ft. Symons cone crusher for recrushing the 2-in. to ½-in. stone to pea sizes.

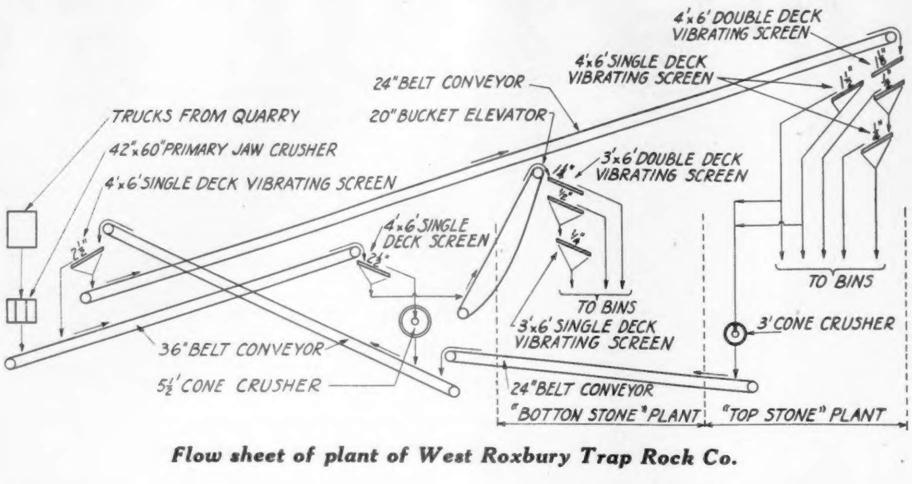
This change was in 1929. Also during 1929 more vibrating screens were added. So it can be seen that each year the introduction of modern equipment in this old operation gradually changed its entire character. Having met changes in specifications the management did not stop there but continued to change with the times and to reduce operating costs. One change that other operators of old plants also can profitably consider is the revamping of the power transmission system. For example at this plant today there is only one belt-driven piece of equipment. That is the primary crusher which is belted to a 200-hp. General Electric induction motor. All other equipment, belt conveyors, etc., have been provided with Farrel-Bacon gear reduction units, so that the old fashioned belt drives and their relatively high operating and maintenance costs are a thing of the past. In their stead are neat, safe and cheaply operated and maintained direct drives through these reduction units. Alemite lubrication is also used for the convyors and throughout the plant, thereby lowering power costs, wear and incidental delays. In the quarry a second 50-B Bucyrus-Erie electric shovel has been added. These changes were made during the winter of 1930-31, bringing the plant up to date and as a net result the owners have a plant that is operating stead-

*"Bottom" stone plant and truck at primary crusher*



*One of the vibrating screens in the "bottom" stone plant*

*Drive of one of the belt conveyors*




***Flow sheet of plant of West Roxbury Trap Rock Co.***

ily and turning out good stone cheaply at a time when many operators have been waiting for an upturn to normal tonnages and profits.

In 1927, when the major change of keeping the two sizes of stone separate was made, it was difficult because of the existing plant structures to use belt conveyors throughout, so that at present the minus 2½-in. stone going to the "bottom stone" plant is elevated to the battery of Niagara fine sizing screens by a bucket elevator. All the other handling of the crushed rock is by belt conveyors. The accompanying flow sheet shows the path of the stone through the plant.

The company has twelve 8-yd. trucks that are used for local distribution. The entire output is shipped by truck as the plant is not served by a railroad. These trucks were purchased new in 1930 and careful records show that the company is trucking its own stone cheaper than could be done by renting or through local trucking concerns. This takes into consideration an allowance of 50% for depreciation the first year. At the end of the year the company expects to turn in these trucks for new ones. That a stone company can do its own trucking cheaper than the contractor, even at the ridiculously low prices often bid by contractors on such work, is interesting.

## Geology of Randolph County, West Virginia

A GENERAL geological report on Randolph county, West Virginia, has been published under date of 1931. This large, illustrated volume of more than 900 pages, with the two large topographical and geological maps accompanying it, gives very complete information on the mineral resources, including limestone and clay, of the county. Randolph county, which is the largest in the state, is located in the central eastern part.

The book is the work of David B. Reger, associate geologist, West Virginia University, Morgantown, W. Va., who was formerly assistant state geologist. James D. Sisler, Morgantown, W. Va., is state geologist.

## Developments in Wet Process Cement Manufacture

VARIOUS methods of drying cement slurry and feeding it into kilns are described in an article by E. Schirm in a recent issue of *Cement and Cement Manufacture*.

The use of chains in the upper end of the kiln for the transfer of heat to the slurry makes it possible to keep the exit temperatures down to 350 deg. C. The spray system, used chiefly in England, also permits low exit temperatures. The difficulty with the latter is the stoppage and wearing out of the nozzles and the constant attention required. The slurry cannot be completely dried while in suspension because a large amount of dust would go up the stack.

Experiments have also been made, introducing the spray at the top of the stack and letting it fall through the gases, and with a separate drying kiln and separate stack. Indirect heating of the slurry in rotary drums has one advantage in that the exit gases are used solely for evaporating the water and the steam is kept away from the gases, but the method is stated to require an elaborate plant and to result in a loss of heat.

Slurry has also been dried by using revolving discs, the lower part of the discs dipping in the slurry and the upper part being exposed to the hot gases. The dried material is scraped off and conveyed to the kiln by a screw conveyor. Large discs are required and the method has not been very successful.

Another method reduces the water content mechanically to about 25% and forms the paste into short cylindrical pieces which are placed on a horizontal revolving grate just ahead of the kiln and in the path of the hot gases. After making one revolution the pieces fall to a second grate and after one more revolution pass into the kiln. It is stated that the gases should leave at not to exceed 100 deg. C.

The Lellep or Lepol system, which has been very successful, is suitable only for dry materials, but a method of using slurry with it is described. In this system (described in ROCK PRODUCTS, March 12, 1932) the raw material, containing about 10% water, is formed into small balls and carried on a moving grate through which the kiln gases are drawn. Very low exit gas temperatures are claimed.

The proposed method of using slurry consists in mixing it with broken firebrick or other solid material which has been preheated and feeding the mixture down through a shaft kiln in such a way that the waste gases from the kiln dry it. The dried slurry and the firebrick are then separated in a rotary screen, the slurry conveyed to the kiln, and the firebrick returned to the top of the shaft. Induced draft is necessary.

## Magnesite Industry in 1931

THE TOTAL QUANTITY of crude magnesite mined in the United States in 1931 was 73,602 short tons, with an approximate value of $499,239, according to reports furnished by producers. This represents a decrease of 43% from the quantity mined in 1930, an advance final summary by the U. S. Bureau of Mines states.

Sales of magnesite of domestic origin in 1931 were 1325 short tons of crude, valued at $14,849, an increase of 18% in quantity and 3% in value over 1930; 5900 short tons of caustic calcined, valued at $180,997, a decrease of 31% in quantity and 30% in value as compared with 1930; and 28,231 short tons of dead-burned, valued at $545,-253, a decrease of 43% in quantity and 40% in value as compared with 1930.

Dead-burned magnesite was quoted in trade journals for 1931 at $25 per short ton f.o.b. California mines, during the latter part of the year. The quotation for the 93% product was reduced from $70 to $68 on the same basis. Dead-burned magnesite was quoted at $22 f.o.b. Chewelah, Wash., throughout the year. In August the price of high grade ground caustic calcined magnesite was scaled down from $48 to $45 per short ton whereas 90% caustic remained nominally at $40, both f.o.b. California producing points; producers reported sales of high-grade material as high as $38 per ton, but much of the output was sold as low as $27 per ton f.o.b. California mines.

The following table gives the quantity and value of magnesite imported for consumption in 1931, according to the Bureau of Foreign and Domestic Commerce:

MAGNESITE IMPORTS IN 1931

| Product | Pounds | Equivalent in short tons | Value |
|---|---|---|---|
| Crude | 998,723 | 499 | $ 5,415 |
| Caustic | | | |
| Lump | 3,198,691 | 1,599 | 28,512 |
| Ground | 2,583,783 | 1,292 | 34,426 |
| Dead-burned | 20,698,138 | 10,349 | 180,436 |

## American Refractories Institute to Meet

THE American Refractories Institute will hold its annual spring meeting in the Wm. Penn. hotel, Pittsburgh, Penn., on Wednesday, May 18.

# New Ideas About Filter Sands

A RECENT ISSUE of *Engineering News-Record* has a symposium on filter sands covering two pages of fine type and an editorial discussion. Much of the matter does not concern producers of filter sand very directly. But all of them will be interested to know that several noted water-works engineers think the effective size-uniformity coefficient method of specifying sands is rather out of date. And there are others who believe that uniformity is not so necessary as it has been thought to be, for they think that any sound, acid-resisting sand can be graded in the rapid washing process so that it will filter with sufficient rapidity.

Malcolm Pirnie, consulting engineer, New York, tells how the present methods of specification came to be adopted. He says that Hazen found on plotting many samples of sand on double logarithmic paper that the curve below the 10% separation and above the 60% separation was practically a straight line. Hence it was concluded that the size in millimeters below which 60% of the sand was finer, divided by the effective (10%) size, would give a figure that was called a uniformity coefficient, and this accurately describes the sand when the effective size is known. Mr. Pirnie says he has always had entire satisfaction from sands selected by such a specification.

Paul Hansen, of Pearse, Greeley and Hansen, Chicago, says that Hazen never intended that the effective size and coefficient of uniformity should be used as purchase specifications and that he always specified a range of sizes with limits for fine and coarse sizes. He preferred to use the size in millimeters because in his time screen sizes had not been standardized and it was difficult to get screen cloth of sufficient accuracy. Mr. Hansen admits that the present specification will secure a good filter sand, but he thinks that more satisfactory sands might perhaps be secured if the specifications gave the percentage of sand that should fall between designated sizes of sand grains.

Abel Wolman, chief engineer of the Maryland Health Board, thinks that no sand index is enough in itself and that the complete screen analysis of a sand must be studied to determine its filtering properties. Hazen's choice of the 10% point for the effective size was perfectly logical, as he himself has found by studying hundreds of analyses as Hazen plotted them. The 60% point might have been 50% or 70%, for any one of these is sufficiently high on the slope of the curve to define it, but since the 60% point is familiar there would seem to be no good reason for going to 50% or 70%, as has been proposed. In his opinion, the Hazen method is as excellent a method of evaluating sand size distributions as has come to light.

Arthur R. Holbrook, of Fuller and McClintock, New York, says that it is the sentiment in his office that the effective size has rather outlived its usefulness as a measure of filter sand, and that it would be better to specify the amount to be passed through or retained on certain sizes of sieves.

G. Gale Dixon, deputy chief engineer, Mahoning Valley Sanitary District, Youngstown, Ohio, devotes most of his discussion to showing that failures to cleanse filter sand properly are more often responsible for filter failures than the characteristics of the sand. But he quotes the Detroit filtering experiments and a paper by R. G. Tyler to show that the real effective size is that of which 30% of the sand is finer. Tyler's paper says that the particles finer than this diameter have a surface area equal to that of the particles coarser than it, and such a sand grain may be termed the surface median.

The specifications given by J. P. Laboon, of J. N. Chester, Engineers, Pittsburgh, Penn., call for a fine sand, 0.35 to 0.45 mm. effective size, with only 1% finer than 0.25 mm. and 90% finer than 0.8 mm., and a uniformity coefficient of not more than 1.65. This is because his firm designs a filter to produce an acceptable affluent with chlorination afterwards, and is a mere factor of safety.

Louis R. Howson, of Alvord, Burdick and Howson, Chicago, Ill., takes the opposite view and says that by placing more emphasis on mixing, coagulation and settling, the water is better prepared, so he feels justified in using a coarser sand, effective size 0.50 to 0.55 mm., instead of 0.35 to 0.45 as formerly. It is his firm's practice to wash the new bed so as to bring the finest grains to the surface and skim them off. This lowers the uniformity coefficient from 1.6 to 1.3.

N. T. Veatch, Jr., of Black and Veatch, Kansas City, Mo., also advocates the use of coarser sands, intending in future jobs to use a sand with an effective size of at least 0.55 mm. He thinks that it would mean more to go directly to screen sizes, specifying a sand that will pass one screen and be retained on another.

***Some Concrete Sands Can Be Used***

Some ordinary concrete sands will make good filter beds, according to E. Sherman Chase, of Metcalf and Eddy, Boston, Mass. He says that up to 1927 his firm had specified filter sand with an effective size of 0.30-0.40 mm. and a uniformity coefficient of 1.6, which sometimes cost as much as $10 per cu. yd., brought in from New Jersey. In that year, in order to get a filter started quickly at Greenwich, Conn., a local concrete sand was bought at about $1 per cu. yd. It had an effective size of 0.355 mm. and a uniformity coefficient of 4.65 when placed in the filters. This was washed with a vertical rise of 24 to 30 in. per minute and the fines scraped off the top. The efficiency, after the sand bed had been graded by repeated washings, was found to be as high as the other filters. Now this firm specifies any good sand that will pass the acid-soluble matter test and that has the other general characteristics of a good filter sand, provided that it has an effective size between 0.35 and 0.45 mm. with no grains larger than ¼ in.

Joseph W. Elms, engineer of water purification, Cleveland, Ohio, refers to his Milwaukee experiments in which substantially the same results were obtained by rapid washing of sand. He believes that the sand should always be graded in this way. Whether sieve size, surface modulus, fineness modulus, surface median, or effective size and uniformity coefficient should be used to describe the sand, he thinks is a matter for further study.

Prof. Gordon M. Fair, of Harvard University, closes the symposium, saying that the evidence so far is that neither Hazen sizes nor manufacturers' ratings of sieves are adequate measures of particle sizes. He believes that the geometric mean size of particle with geometric standard deviation, obtained by direct measurement under the microscope more truly represents the central tendency and the dispersion of particle size. He hopes for a simplification of measurement of sand sizes and approximations that are capable of engineering application.

## Quartz Gem Stones

QUARTZ maintains a rather conspicuous position among gem stones, despite its being the commonest and, in its natural form, the most easily recognized of mineral substances, states U. S. Bureau of Mines Information Circular 6561. This prominence is due to the extensive use of amethyst and also to the wide employment of yellow quartz, which is called topaz by jewelers.

Owing to differences in color and texture quartz has been given a great variety of names. Many varieties of quartz are used in the cheaper grades of jewelry, but with the exception of the better grades of amethyst, most quartz material is worth little.

Quartz may be identified by its glassy luster, conchoidal fracture, hardness and crystal form. It is widely distributed and is found in rocks of all ages and of nearly every type. Production in the United States of most varieties of quartz of gem quality has always been rather small. Only a few domestic varieties are worth more than the cost of cutting.

The bulletin gives a selected list of references on this subject and has an appendix with names of species and gem varieties.

## Prevention of Dust Explosions

A GROUP of nine American Standards relating to dust explosions in various industries have just been published by the U. S. Bureau of Labor Statistics as its bulletin No. 562.

# The Manufacture of Portland Cement*

## Part II—Definition of Portland Cement; Composition; Manufacturing Process; Costs

By S. E. Hutton
Consulting Engineer, Seattle, Wash.

PORTLAND CEMENT is an artificial chemical product, the essential constituents of which contain lime, silica, and alumina. Iron is also present in commercial cements, and is a valuable component except in white cement. Small percentages of magnesia, sodium, potassium, and of some other elements are also present.

A complete definition of portland cement comprehends the current "Standard Specification and Tests for Portland Cement" promulgated by the American Society for Testing Materials. These specifications, which are revised from time to time, fix the minimum values for the most important qualities of cement on which representatives of manufacturers, users, and investigators are able to agree; but they do not cover all recognizable or desirable characteristics of cement. Different brands, and often different samples of the same brand of cement, exceed the minimum standard requirements in varying degrees, and they vary, also, in other properties, such as early strength, color, and working qualities.

The unit of quantity of cement is the barrel, 376 lb., or four 94-lb. sacks in the United States. In Canada, a barrel is 350 lb. and a sack is 87.5 lb.

*COMPOSITION OF CEMENT*—Cement is not one definite chemical compound, but a mixture of several compounds of lime with silica, alumina, and iron, which must be present within fairly well defined limits that are determined by the qualities required in the cement, and by the cost and technique of manufacture. These factors, and prospective or possible changes in them, govern the qualities acceptable in raw materials.

### *Raw Materials—Kinds*

The raw materials for cement making are of two kinds, (*a*) calcareous materials, including limestones, chalk, marl, and shells, as the principal source of lime, and (*b*) argillaceous materials, including clays and shales, and materials of similar composition such as coal ash and slag, as the principal sources of silica, alumina, and iron.

### *Raw Materials—Sources*

The essential constituent of limestone is calcium carbonate ($CaCO_3$), but limestones vary widely in composition. For cement making, limestones may contain considerable argillaceous material, silica, or silicates, but only a small percentage of magnesia is permissible. Clays and shales consist essentially of various proportions of silicates and aluminates, but usually contain compounds of iron, calcium, magnesium, alkalies, and sulphur in small proportions.

### *The Manufacturing Process*

The fundamental operations in the manufacture of cement are:

(1) The mining, quarrying, or dredging of the raw materials.

(2) The transporting of raw materials (as well as fuel, gypsum, and water) to the mill.

(3) The handling and storing of materials in the raw and partially processed states.

(4) The reducing of raw materials to a very finely pulverized state.

(5) The accurate proportioning and thorough mixing of the raw materials.

(6) The burning of the "raw mix" into "clinker."

(7) The cooling of the clinker.

(8) The handling and storing of clinker.

(9) The grinding of clinker (with a small admixture of gypsum as retarder) into a very fine powder.

(10) The handling and storing of cement in bulk.

(11) The packing and shipping of cement, and

(12) The analyzing and testing of raw, partially processed, and finished materials for the purpose of controlling quality and costs.

In order to carry out this process in a commercially successful way, it must be done on a rather large scale, and there are required large and possibly expensive deposits of suitable raw materials, an expensive plant, large capital, and a well organized operating crew, including skilled mechanics and technically trained men.

### *A Classification of Costs*

The costs of manufacturing and selling cement may be classified conveniently for study and discussion as (*a*) manufacturing, (*b*) delivering to consumer, (*c*) selling, and (*d*) overhead. Obviously, that project is best for which the sum of these, per barrel, is a minimum in any competitive district. It does not follow that each of the four classes of costs enumerated must be a minimum in order to make their sum a minimum. There are numerous cases in which an advantage in manufacturing cost is more than offset by a disadvantage in delivery cost.

### *Manufacturing Costs*

Manufacturing costs vary from plant to plant in any year, and from year to year in any plant. This is due largely to variations in output of an operation in which fixed charges are high, and in which current expenses cannot be varied directly with output; but many other matters, some within and some without the control of the management, influence costs. It is important to bear this in mind in considering a new enterprise. No one fixed figure can be determined for the cost of manufacture in any new plant, nor in any competing plant. Records of past performances are only bases for estimating future results, for not all contingencies can ever be anticipated, or evaluated precisely. Competition is probably best gaged by comparing relative advantages and disadvantages in great detail, and estimating the probable maximum and minimum values of their differences, rather than their absolute values. Substantially the same thing may be said of selling and overhead costs.

The classification of details of manufacturing costs may well follow the outline previously given of the steps in the manufacturing process, with the cost of the raw materials, in place, added at the head of the list. In comparing one property, or one piece of equipment, or one method, or one process with another, there must be taken into account not only the relative labor costs involved; but, also, investment required, fixed charges, depreciation, and maintenance, all in connection with the output for which profitable use can be found, otherwise false conclusions will be drawn.

### *Materials and Costs*

In order to meet current cement specifications, raw materials within rather definite ranges of composition must be available. For example, an argillaceous limestone must contain an average of about 77% of calcium carbonate as it goes to the mill, provided that the silica, alumina, and iron are present in acceptable proportions. If it runs high in silica and low in alumina and iron, it must carry more than 77% of calcium carbonate, or have high calcium rock mixed with it. There are known deposits of limestone, averaging as much as 85% of calcium carbonate, unfit for cement making because variations

are so wide that satisfactory proportions could not be maintained in the raw mix at reasonable cost. Limestones containing silica (as flint or chert) are usually variable in composition, and in difficulty and uniformity of grinding. With some materials, three or four components are required in the raw mix; with others, only two.

In other words, certain minimum conditions of composition must be met by mixtures of the two or more components in the raw mix in order to make a marketable cement, and some materials are preferable to others from the standpoints of cost of processing, ease and precision of composition control, and ability to meet different specifications or new standards.

#### *Value of Raw Materials*

No one of the raw materials for cement making, including fuel and power, can be considered and evaluated alone, for they are inter-dependent. Various possible combinations must be considered and compared with each other. The important basic considerations are (*a*) the chemical and physical properties of the plant product, and (*b*) the cost of realizing them.

A considerable range of proportions of silica, alumina, and iron in cement is permissible. Some permissible combinations are believed to be better than others, for some purposes at least, and the acceptable and preferred cement compositions must be determined. Then the raw materials can be considered, their acceptable compositions fixed, and their values estimated. To illustrate, if coal is the only fuel available, some coal ash, which may run high in alumina, will be added to the raw mix in the kiln, and the maximum permissible alumina content in the raw materials might be lower than if oil or gas fuel were to be used; or, it might be necessary to add some expensive high calcium rock or some silica to the raw mix made from some raw materials, and not to the raw mix from others. Though oil and gas are available for cement burning in many districts, and may be available for a long time to come, it might be necessary to use coal ultimately, and analyses of available coals should, therefore, be among the first information collected regarding raw materials.

Calcium carbonate is the principal constituent of the raw mix from which cement is made, being about 77% of it, and therefore limestone is the most important raw material. The greater its content of calcium carbonate, and the more nearly uniform it is in composition, the more valuable it is, for the easier it will be to control the mix both as to composition and uniformity. Just as the cost of cement delivered at the point of consumption is the really significant figure in a cement enterprise so is the cost of calcium carbonate in a uniform high grade raw mix the important figure in comparing one available limestone deposit with another.

There is no basis for fixing an absolute value of a limestone deposit. One can only estimate its value as compared with some other available deposit, or with a competitor's deposit. This can be done best only when very complete data are at hand covering the location of all sources of the required raw materials and the quality, quantity, and accessibility of each supply.

From estimates of probable sales, and of the period over which the costs of building a plant and organizing a going concern can be written off at a reasonable rate, the minimum quantity of limestone required for an enterprise can be estimated. Preferably, it should be available from a single deposit. The quality of limestone acceptable is determined by the composition of the cement to be made, and by the other raw materials with which it is to be used. If the output of the quarry is variable in composition, it must be practicable to blend materials during the manufacturing process so as to produce always a cement that will meet the standard specifications, even though the composition and numerous other characteristics of the mill product may vary. It is highly desirable to be able to produce a product of unvarying characteristics.

The determination of the value of a limestone deposit for any cement enterprise really begins with the estimated manufacturing costs of existing and of possible future competitors. Having computed and compared, for all feasible plant and raw material locations, the sum of (*a*) the costs of shipping into the mill the raw materials required, (*b*) the cost of shipping the finished material to market, and (*c*) costs above or below an ideal standard, due to conditions peculiar to each combination such as high processing cost of poor materials, high or low taxes, exacting building codes, high or low wage scale, etc., the most advantageous combinations can be found. Then they can be compared in detail with each other and with existing enterprises. Thus, with much labor, there can be estimated the maximum investment in limestone and the maximum transporting and processing costs that the projected enterprise will be able to carry.

The price to be paid for a limestone deposit, or the royalty to be paid on rock as taken, is a matter of bargaining, for which the prospective purchaser should prepare himself by developing as many competing sources as possible, by investigating their extent and character as thoroughly as possible, by computing the relative present-worth and royalty values of all of them, and by estimating their costs of development, and operation, and the cost of delivering rock to the mill.

#### *Plant Location*

Not all of the materials and facilities for making and delivering cement are ever found in one place. The problem is to make the best compromise of advantages and disadvantages, in an effort to realize the minimum cost of the delivered product. Since transportation of raw materials from their sources to the mill and of the finished product to points of consumption are two of the principal items in the cost of delivered cement, plant location is a matter of the utmost importance. No simple rule can be given for selecting the best location. It can be determined only by collecting and studying carefully a great deal of data.

The general location of the plant—whether at the source of the principal materials, near the principal market, or at some intermediate point—is the matter of first consideration. Frequently the less promising locations can be eliminated by compiling and comparing for all prospective locations the sum of in-freights on raw materials and out-freights on cement, but all locations that warrant serious consideration should always be compared in great detail before settling on one of them. All cement plants were formerly, and many still are such dust nuisances that they would be tolerated only in places remote from cities and from property of any considerable value, but with good equipment and intelligent operation cement plants need not be excluded from any industrial district.

The outstanding requirements for a cement plant site are a location and surroundings such that suits for damages or for abatement of operation as a nuisance are not likely to develop, sufficient area for present and prospective future operations, suitable bearing power for heavy foundation loads, accessibility by trucks, by as many railways as possible, and by water craft, and reasonable cost, tax rates, and building restrictions. Power and water supplies and costs must also be considered.

(*To be continued*)

## Safety in Use of Explosives

A VERY informative book, entitled "Safety in the Handling and Use of Explosives," has just been issued by the Institute of Makers of Explosives, New York City. The methods recommended are based on years of study and the combined experience of many men engaged in the use of explosives in practically every type of work. The fundamentals of approved safety practices are described.

Under the several heads are found clear discussions of such important topics as the transfer of explosives to the consumer's magazine, storage, transportation to the working face, opening cases of explosives, making and handling primers, loading holes, tamping holes, firing shots, returning to the face, secondary blasting, blasting falls of rock, prevention of misfires, and the organization of operations, selection and education of men and maintenance of discipline. A list of "Don'ts" summarizes many of the most frequent causes of accidents.

Copies of the book are being distributed to users of explosives by the member companies of the institute.

# Drilling and Blasting Studies

ANDREW P. ANDERSON, highway engineer, gives some interesting data on drilling and blasting in the February issue of *Public Roads*. While primarily intended for highway contractors, the data have considerable meat which should be of interest to quarry operators, particularly in jackhammer operations.

The author points out the effect of poorly blasted rock on the shovel production. He believes for efficient work that the largest rock should be ⅕ the smallest inside diameter of the dipper and such rock can be shoveled at a rate equal to that of common dirt.

On 1¼-yd. shovels time studies were made and in well blasted ground 23.5 sec. were required per cycle. On poorly blasted rock the cycle was increased to from 33.5 to 45 sec.

The quantity of material actually handled by a 1- to 1¼-yd. dipper per cycle varied from 0.70 cu. yd. to 0.50 cu. yd., the larger yardage being on well shattered rock. The accompanying table was a result of studies on ⅞- to 1¼-yd. shovels.

His report shows two 1-yd. shovels each of which had an average operating cost of $21 per hour for loading, hauling and dumping. One shovel working in well blasted rock had an average rate of 67 cu. yd. per hr. and the other in poorly blasted rock handled 36 cu. yd. per hr. It cost 31⅓ c. per yd. in one case and 58⅓ c. per yd. in the other, thus indicating the economies possible by having well shattered material.

In drilling and blasting rates, the author points out, there has been no appreciable progress made in the last six years. Therefore economies are sought by proper relationship between size of shovel, size of material, depth of holes, spacing, etc. In other words, one gains the impression that equipment for drilling and blasting has not made advances but proper use of the available equipment makes the difference between failure and success.

As most of his investigations were on cuts or side hill excavations, they would be naturally shallower than cuts made in many quarries. Hence his suggested method of spacing drill holes must be studied with that thought in mind. The accompanying illustration shows a plan and elevation of a rock cut where two rows of holes have been drilled. It will be observed that the holes are staggered. The relations between the spacing of holes, depth of cut, and depth of drill hole below grade are expressed as follows:

$a$ = Ratio of depth of cut to spacing of holes across cut.
$b$ = Ratio of depth of cut to spacing of holes from face, or of rows across cut.
$c$ = Coefficient of depth of drill hole below grade. Its value, for most materials, lies between one-fourth and one-half, except in very shallow holes.
$d$ = Depth of cut at drill hole.
$ad$ = Distance between holes across cut.
$bd$ = Spacing of rows or distance of holes from face of cut.
$cad$ = Depth of drill hole below grade to which rock is to be removed.
$d + cad$ = Total depth of drill hole.

In this arrangement the drill-hole spacings parallel and perpendicular to the face of the cut are not equal, but each is a function of the depth. The depth drilled below grade is a function of the spacing rather than the depth.

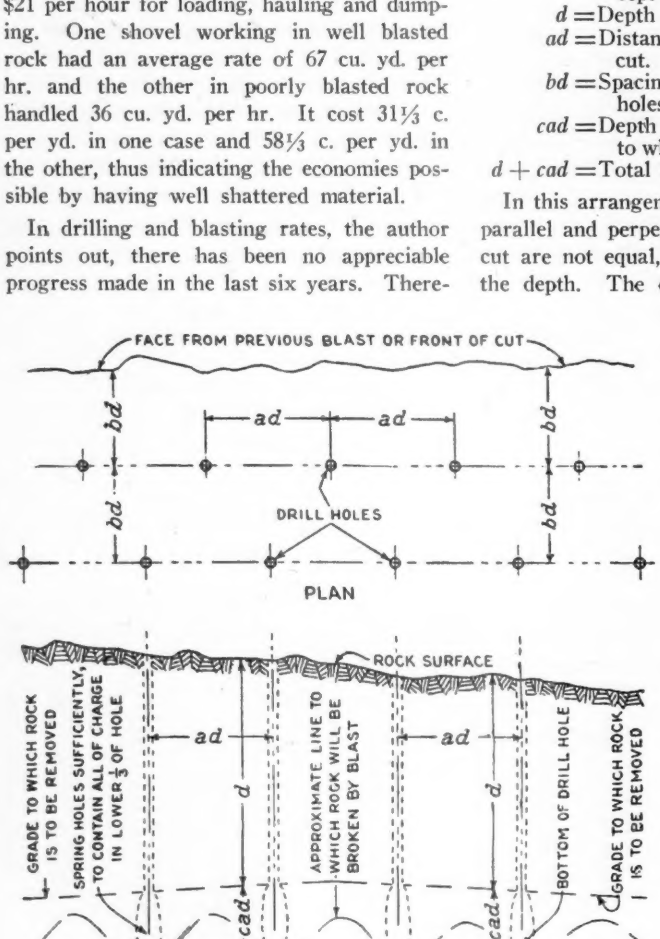



***Diagram for location of drill holes***

If the distances between holes and rows as well as the depth of the holes are given in feet with the designations as indicated in the illustration, the volume of material above grade line may be expressed in cubic yards for each hole as:

$$V = \frac{abd^3}{27}$$

while if $D$ be used to designate the linear feet of drilling required per cubic yard of pay material, we have:

$$D = \frac{27\,(1 + ac)}{abd^2}$$

Thus, within certain limits the volume of pay material per drill hole varies directly as the cube of the depth of the cut. The amount of drilling per cubic yard of pay material varies inversely as the square of the depth of the cut. The amount of explosives required per cubic yard of any given material, however, varies only slightly with the depth of the hole. These facts help to explain why the unit cost of removing shallow cuts of hard rock is so high.

The amount of drilling, in linear feet, required per cubic yard of pay material for four cuts of depths indicated is:

| | Lineal ft. |
|---|---|
| 2-ft. cut | 14.25 |
| 4-ft. cut | 3.56 |
| 8-ft. cut | 0.89 |
| 16-ft. cut | 0.22 |

Thus, if the cost of drilling be 30 c. per linear foot, the cost of drilling alone is $1.07 per cu. yd. of pay material for the 4-ft. cut, $0.27 for the 8-ft. cut, $0.07 for the 16-ft. cut and the entirely prohibitive figure of $4.27½ for the 2-ft. cut. Even in the case of the 4-ft. cut, the cost of the drilling alone is higher than the price frequently bid for moving solid rock, while on the other hand in the case of the 16-ft. cut the unit drilling cost becomes but a relatively small item in the total cost of moving the material.

The amount of explosives required per cubic yard of material tends to remain nearly constant, increasing slightly as the depth of the holes decreases. Both theory and practical experience indicate that in shallow cuts it is cheaper to drill proportionately much deeper below grade than is advisable in the deeper cuts.

Drilling deeper holes in the case of shallow cuts also will permit a wider spacing of holes.

Drilling costs and rates were discussed by the author. Most of the essential data appear in the tabulation.

The studies show that under normal conditions the drill is cutting rock only from 35 to 60% of the total time the operator is on the job. The rest of the time is largely consumed in performing a number of necessary but unproductive operations, such as changing steel, blowing the hole, moving to the next hole, oiling the drill, etc.

The advantage gained due to soft or easily drilled rock was apparently offset by greater delays as shown by the stop-watch studies.

The effect of air pressure is also discussed and the essential data are shown in the table following.

The records of many thousand stop-watch studies show an average exchange time of about 45 sec. for holes from 12 to 15 ft. in depth, while the individual readings range from 12 sec. to somewhat over 6 min., and the percentage of the operator's time consumed in exchanging steel varies from less than 3% to over 25%, with an average of 8.9% for 20 fairly large jobs.

Considerable data are given on the amount

of explosives to use and the essential data given are shown in the tabulation which follows:

EFFECT OF AIR PRESSURE AT DRILL ON RATE OF DRILLING WITH 70-LB. JACKHAMMER IN GOOD CONDITION. HOLES 8 TO 15 FT. IN BOTH STUDIES

| Working pressure at drill, lb. per sq. in. | Rate of drilling while drill was in actual operation Feet per hour | Number of 1-hour studies |
|---|---|---|
| Hard Limestone with Horizontal Strata | | |
| 56 | 11.0 | 1 |
| 60 to 70 | 23.8 | 22 |
| 70 to 80 | 22.8 | 44 |
| Above 80 | 28.9 | 2 |
| Hard Granite | | |
| 45 | 1.5 | 1 |
| 50 | 8.7 | 3 |
| 60 to 70 | 13.9 | 6 |
| 75 to 87 | 21.8 | 5 |

Mr. Anderson believes that where heavy shooting is not permissible the only way in which good fragmentation can be obtained is by a closer spacing of the holes. A foot of drill hole seldom costs less than a pound of high-grade explosive and frequently as much as 2 lb. The spacing should therefore be the greatest at which sufficient fragmentation to permit easy shovel operation can be achieved within the limits of the heaviest permissible shooting.

As the author himself points out, perhaps the most significant feature disclosed by this study of drilling and blasting in highway grading work is the very general absence of that grade of supervision, organization, and matured planning which is given to the remainder of the job. Frequently all decision as to such important points as the location, spacing, and depth of holes is left entirely to the drillers. [This same condition also too often appears in rock producing quarries. —THE EDITORS.] Too often this results in the holes being placed where it is convenient to drill rather than where they will do the most good. This lack of planned direction usually also extends to the method of loading and the amount of explosives used in each individual hole. With such conditions forming the general rather than the exceptional practice, there is no wonder that nearly three-quarters of all rock jobs reported the shooting as unsatisfactory from the viewpoint of fast, easy shovel operation. All the available data indicate that the cost of this poor shooting was as high and frequently much higher than on those jobs where the shooting was good.

AVERAGE RATES OF PRODUCTION AND OPERATION ON 20 ROCK JOBS

| Condition of blasted rock for handling by shovel | Average size of shovel Cu. yd. | Average dipper load Cu. yd. | Shovel production per hour: Cubic yards | Shovel production per hour: Dippers Number | Shovel production per hour: Dippers Cycle Seconds | Percentage of working time lost by shovel due to large rocks |
|---|---|---|---|---|---|---|
| Good | 1.02 | 0.68 | 65.5 | 96.3 | 24.4 | 8.7 |
| Fair | 1.08 | 0.49 | 38.7 | 79.7 | 32.2 | 14.5 |
| Poor | 1.12 | 0.50 | 31.8 | 63.3 | 36.7 | 16.3 |

AVERAGE RATES OF PRODUCTION AND TIME LOSSES FOR DRILLING IN VARIOUS MATERIALS; 60- TO 70-LB. JACKHAMMERS USED IN MOST CASES

| Item | Sandstone, hard shale, hardpan, disintegrated granite Ft. | Granite, porphory, felsite, trap, basalt Ft. | Hard limestone, stratified but of uniform hardness Ft. | Limestone, stratified, with clay seams Ft. | Weighted general average of studies Ft. |
|---|---|---|---|---|---|
| Feet drilled per hour, total study time | 13.8 | 14.8 | 15.5 | 11.5 | 14.2 |
| While drill was in operation | 36.2 | 28.9 | 24.2 | 21.2 | 26.1 |
| DELAYS DURING STOP-WATCH STUDIES* | | | | | |
| Change drills | 12.1 | 9.8 | 7.1 | 7.8 | 8.9 |
| Clean or blow holes | 23.4 | 10.0 | 4.0 | 14.0 | 11.1 |
| Steel stuck or broken | 15.8 | 7.6 | 5.3 | 5.3 | 7.3 |
| Move to new hole | 2.5 | 4.9 | 7.2 | 3.4 | 4.0 |
| Springing holes | ...... | 1.5 | 1.0 | 1.7 | 1.4 |
| Operator | 3.2 | 4.4 | 4.7 | 4.0 | 4.0 |
| Mechanical trouble | 0.7 | 2.2 | 3.2 | 2.0 | 2.0 |
| No steel | 0.2 | 3.8 | 1.7 | 0.5 | 2.6 |
| Miscellaneous | 4.1 | 4.4 | 1.9 | 7.1 | 4.3 |
| Total lost time while out on job | 62.0 | 48.6 | 36.1 | 45.8 | 45.6 |

*Delays are tabulated in percentage of available working time.

AVERAGE AMOUNT OF EXPLOSIVES USED PER CUBIC YARD OF PAY MATERIAL ON 17 TYPICAL JOBS

| Job No. | Explosives per cubic yard: Dynamite or gelatin Springing holes Lb. | Dynamite or gelatin Blasting Lb. | Black powder Blasting Lb. | Total Lb. | Condition of material for moving with shovel | Kind of material | Average depth of holes (approx.) Ft. | Average spacing of holes (approx.) Ft. |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.04 | ...... | 0.85 | 0.89 | Poor | Soft and seamy granite | 30 | 25 by 18 |
| 2 | 0.55 | ...... | 0.98 | 1.53 | Poor | Hard basalt | 18 | 19 by 19 |
| 3 | 0.27 | 0.44 | ...... | 0.71 | Good | Massive granite | 14 | 10 by 8 |
| 4 | 0.01 | ...... | 0.55 | 0.56 | Fair | Conglomerate | 15 | Variable |
| 5 | 0.25 | 0.85 | ...... | 1.10 | Poor | Stratified limestone | 16 | 15 by 12 |
| 6 | 0.06 | ...... | 1.06 | 1.12 | Good | Shale | 13 | 12 by 12 |
| 7 | 0.02 | 0.03 | 0.45 | 0.50 | Good | Disintegrated granite | 10 | Variable |
| 8 | 0.15 | 0.16 | 0.67 | 0.98 | Fair | Stratified limestone and shale | 12 | 10 by 10 |
| 9 | 0.02 | 0.17 | 0.50 | 0.69 | Good | Seamy basalt | 21 | 15 by 15 |
| 10 | (*) | 1.90 | ...... | 1.90 | Very poor | Hard granite | 5 | 3 by 3 |
| 11 | 0.25 | 0.75 | ...... | 1.00 | Poor | Very hard granite | 14 | 8 by 8 |
| 12 | 0.55† | 1.00 | ...... | 1.55 | Good | Very hard felsite | 13 | 7 by 7 |
| 13 | 0.14 | 0.59 | ...... | 0.73 | Fair | Hard schist | 12 | 9 by 9 |
| 14 | 0.10 | 0.50 | ...... | 0.60 | Good | Foliated granite | 10 | 10 by 10 |
| 15 | 0.18 | 0.75 | ...... | 0.93 | Fair | Hard granite | 16 | 8 by 8 |
| 16 | 0.15 | 0.87 | ...... | 1.02 | Good | Very hard granite | 16 | 8 by 8 |
| 17 | 0.10 | 0.47 | ...... | 0.57 | Good | Soft granite | 18 | 10 by 10 |

*Near close of studies springing was begun using approximately 0.30 lb. of 60% dynamite per cubic yard for springing and 1.60 lb. for blasting.

†Part of this was used in burning the deeper holes to keep drills from sticking.

## Potash Industry in 1931

POTASH produced in the United States in 1931 amounted to 133,920 short tons of potassium salts equivalent to 63,880 short tons of potash ($K_2O$). Sales by producers amounted to 133,430 tons of potassium salts with an equivalent of 63,770 tons of $K_2O$. The potash materials of domestic origin sold by producers in 1931 were valued at $3,086,955. About 20,000 tons of potassium salts with an available content of 10,500 tons of $K_2O$ remained in producers' stocks December 31, 1931. The output increased 26.5% in gross weight with an increase of 4% in $K_2O$ content. The sales of salts increased 36% with an increase of 12.6% in $K_2O$ content. The total value of the sales increased 3%. About the same amount of crude salts remained in the hands of producers at the end of 1931 as at the end of 1930, an advance fiscal summary of the Bureau of Mines reports.

The increase in production was due to the opening of the potash-bearing mine near Carlsbad, N. M. This together with potash obtained from salines in California and from distillery residue from molasses in Maryland formed the greater part of production.

The potash salts imported for consumption into the United States in 1931, according to the Bureau of Foreign and Domestic Commerce, amounted to 578,657 short tons. The estimated $K_2O$ equivalent of these imports was 215,524 short tons. This represents a decrease of 41% from 1930. The value of the imports was $16,506,069, or 33% less than in 1930.

The exports of potassium salts amounted to 1159 short tons of potassium compounds (not fertilizer) valued at $370,935; 31,291 short tons of potassium chloride or muriate, valued at $1,228,584; and 1169 short tons of other potash fertilizers, valued at $38,525. These figures represent a decrease of 8% in quantity and 26% in value for potassium salts (not fertilizer) and an increase of 90% in quantity and 97% in value for total potash fertilizer material.

# Liming for Vegetable Crops*

By Prof. R. A. Koon
Market Garden Field Station
Waltham, Mass.

THE purpose of this brief paper is to pass on to you certain information which I have secured concerning lime and its value in vegetable growing. This information has been gleaned from my own actual observation as to the effect of lime on certain truck crops growing under practical, commercial conditions, and is not the result of any experimental effort on my part. By this method the chance of error is great, I admit, and yet the cases cited have been repeated so frequently and over rather a wide area and with the same results, that they are convincing even if only approximate.

Few exact comparative yields under Massachusetts conditions such as we might secure from a technically constructed experiment are available. In most instances the observations were made simply by going out into the growers' fields during the growing season or at harvest, at which times the difference between limed and unlimed areas was so conspicuous as to fairly hit one between the eyes.

The farms which furnished the facts, which I am assured are facts, are principally in the counties Barnstable, Bristol, Norfolk, Middlesex, Essex and Worcester. In passing it is not out of place to mention that the value of vegetables grown in Massachusetts is about $8,000,000 a year. Middlesex county alone produces $3,000,000 worth.

At the Market Garden Field Station we are called upon to make acidity tests of market garden soils almost daily. In addition to this our men are continually making tests when they are out on the farms. The majority of such tests show a need of lime for the particular crops being grown, and the requirement varies from 1 to 4 tons. The average requirement seems to be about 2 tons. Nearly 75% of the market gardens would be benefited by lime, and probably not more than 10% ever have it. This is an admission at the outset that Massachusetts market gardeners should use more lime.

The most acid soils are found on Cape Cod, where turnips and asparagus and strawberries are grown commercially. Turnips and asparagus on many of these areas could be greatly increased in yield by applications up to 4 to 5 tons of lime per acre, although the practice of using lime on these crops is not followed to any degree on the Cape. Of the two crops, turnips show a greater tolerance to acidity than asparagus. However, turnips are certainly not tolerant to an acidity which requires 4 tons of lime to correct.

*Paper read at one of the New England Lime Conferences.

### *Asparagus—Strawberries*

With the rapidly growing popularity of asparagus, growers have given more attention to the culture of the crop. They have discovered that to secure the largest stalks and the greatest yield, soil must not be sour. I believe that this crop is decidedly opposed to growing in even slightly acid soil. There appears to be no harmful effects if the soil is brought up to the neutral point. Asparagus growers must fertilize annually and heavily at the end of the cutting season and often once or twice thereafter until cold weather. This means that there must be no limiting factor such as lack of lime in this particular program. The conviction is growing among these farmers, not only on the Cape, but in Concord as well, that more lime is needed on asparagus.

It is quite generally known that strawberries will do well on sour land. But we know that in this case "sour" is a relative term and that soil can be even too sour for this crop as has been proved more than once.

### *Spinach—Beets*

The most exacting crops as to soil condition which come to our attention are spinach and beets. For many years back growers of spinach complained of yellows, which term describes the color of the foliage. Now, there is a disease called "yellows," which is rather rare here in the North, but the principal cause of spinach yellowing here is soil acidity. The light color of leaf renders the crop unmarketable and low yield accompanies it. On more than one occasion I have seen a field of young spinach brought up to a vigorous condition before cutting by a broadcasting of lime followed by cultivation and rain. This seems to be rather an unusually rapid action of lime. Of course the proper time to have applied the lime would have been during the preparation of the land or to a preceding crop. Spinach brings a low price on the market, and for that reason every obstacle to its growth must be removed. If it were not for the well established practice of top dressing it with nitrate of soda there would be more failures than there are.

Beets suffering from soil acidity turn very red in the leaf, and the bottoms fail to fill out. In fields showing this condition, soil tests have in every case verified this need of lime.

On one occasion a vegetable grower called my attention to a field of sick beets, as he called them, and remarked to me that they needed lime. He took me to one spot in the field where the beets were vigorous in growth, with roots twice the size of those surrounding. He volunteered the information that it became necessary the summer previous to spray the roof of the greenhouse with whitewash for shade. The residue from the spray tank had been dumped on the beet field on the spot referred to. He needed no further instruction as to what to do.

Spinach planted after spinach, beets following beets, or the one crop succeeding the other on the same area, appears to bring about rapidly an acid condition unfavorable to later plantings of either and which necessitates the use of lime.

### *Celery—Cabbage*

Another crop sensitive to acidity is cabbage. Usually, however, so much horse manure and nitrate of soda are employed in its culture that the soil seldom arrives at the unfavorable stage. Where celery growing is attempted on sour land, however, failure invariably results.

Cabbage and cauliflower are frequently planted on sod land, not so much by commercial market gardeners, who have little sod, but by general farmers who want to grow a cash crop or win back an area to cultivation. Sod is often so sour that a good crop is not realized. An application of lime on the fall-plowed land would have given a different answer. Both these crops respond to liming even when the soil is only slightly acid. Probably most of the lime has been used on cabbage and cauliflower in an endeavor to eradicate club-root, but the beneficial effect on the crop is just the same as though it were employed to sweeten the land alone. Although lettuce is reported by Rhode Island as being a lime-lover in the same group with spinach and beets, my observations have thus far failed to verify this in my own mind. I have yet to learn of a single instance in this state where a lettuce failure could be traced directly to acidity. There have been cases where other toxic conditions were responsible for lack of vigor, but lime was not the remedy needed. Excellent yields of lettuce are regularly obtained on medium acid soil.

### *Cucumbers—Carrots—Tomatoes*

Greenhouse cucumbers are frequently benefited by liming either preceding the crop or sometimes during the 6 to 10 months growth.

Carrots, tomatoes and peppers respond to lime on very acid to medium acid soils. The most congenial soil environment for them is between a slightly acid and a neutral range.

So far as I have been able to determine, the other important vegetables, sweet corn,

beans, peas, squash and radish, are not greatly flavored nor injured by liming, either by applications in preparation for those crops or to preceding crops. It is evident, of course, that where extreme conditions of acidity exist, even these vegetables should have a soil corrective.

Now, it is apparent from what I have stated that there is still likelihood of one individual of being accused of being lime crazy. That is the term applied to persons who advocate much lime, I believe. But I am convinced that the market gardeners of Massachusetts are not using enough of it. I am urging the use of more lime, and although this urging is tempered with caution, but very little caution is necessary yet.

One encouraging fact is that the tendency is for market gardeners to learn more about their soil condition than previously and act upon it. For the last hundred years the only thing added to the vegetable soil was animal manure. This substance is now a commercial commodity of growing scarcity and increasingly high price. The market gardeners have naturally turned to commercial fertilizers and incidentally to lime. As manure becomes scarcer more fertilizer and lime will be used. It is inevitable.

Finally I wish to drop a suggestion for the consideration of the representatives of the lime trade gathered here today.

I wish every farmer in this state had a Soiltex outfit. On how many farms do you suppose lime would be unnecessary? Perhaps wishing this magic box for every farmer is wishing too much, but it is not impossible to have many more in each community than there are. A few hundred of these little sets given out as souvenirs would certainly be good advertising and would increase the sales of lime.

## Lime for Forage Crops*

**By Prof. J. P. Helyar**
Department of Agronomy
Massachusetts Agricultural College
Amherst, Mass.

THE basic commodity of farming is soil fertility. We grow plant and animal products, handle them and sell them, but they originate in soil fertility. Agricultural practices of an individual or of an area determine the soil fertility of a farm or an area. New England is a part of the so-called hay and pasture belt where forage crops occupy a large portion of the cultivated land. A survey of the practices followed in this area indicates that the early farm practice was essentially one of taking out the stored fertility. This was followed by a period of purchasing soil fertility in the form of western grain products which for a time proved to be a more economical source of fertility with which to make milk than that produced at home. The net result is a general condition of depleted fertility, not only in terms of plant food but in other elements too.

Western fertility, or, more specifically, grain and its by-products, has materially increased in cost. This change gives a new valuation to the forage crops that can be grown in this section, and a greater production of home-grown feed is warranted. But even so, conditions demand efficient production. This depends on proper fertility conditions as well as on efficiency in growing and handling the crops.

Here in Massachusetts we are stressing to the dairy farmer the advantages to be gained in growing and feeding more and better roughage to replace some of the purchased grain in the feeding of his herd. Any great change along this line as to quantity or quality is not possible until fertility conditions are changed. This is absolutely necessary to get production per acre and to get quality.

Going back again to the basic commodity, we are confronted first with producing fertility, and emphasizing that lime must play a big part in this, not only for acid-sensitive crops but for the benefit of all crops that are not definitely injured by lime. For purposes of this discussion the following may well be used to illustrated the general proposition:

*Soil fertility*

| | |
|---|---|
| | ............Available plant food |
| L | |
| | ............Moisture |
| I | |
| | ............Good tilth |
| M | |
| | ............Biological activity |
| E | |
| | ............Absence of toxic materials |

Lime has an effect on all these, directly or indirectly. Absence of this element is a limiting factor in efficient production. Because of the preponderance of what is called grass hay, and because of the acid condition of most of our land, there is a big market for lime for improvement of soil fertility. The job is to go out and sell it. There are many barriers. It's going to take united effort to get it across.

Some are getting the lime habit, using it every time a piece of land is seeded down. With such a program the productive capacity of the farm is increasing as to quantity and quality. The Soiltex outfit has been a valuable instrument in visualizing soil acidity. It helps to sell lime, it helps to sell fertility.

There is considerable and a growing interest in alfalfa—a good crop to sell lime to. Sweet clover for pasture is coming along, another good lime crop. There are easy markets to sell lime. It's the large acreage of sour, infertile hay land that's going to need the lime. Selling it for fertility—selling it for the rotation, corn, clover and grass hay, is the big job. Can we do it. Who has the answer?

*Paper read at one of the New England Lime Conferences.

## Fluorspar Industry in 1931

THE FLUORSPAR INDUSTRY in 1931, in common with the industries (except the manufacture of fruit jars) on which it is dependent, suffered from the extreme curtailment in general business activities that prevailed in the United States. In consequence, the year 1931 was one of decreased production, declining prices, and smaller earnings, according to an advance summary by the United States Bureau of Mines.

Shipments of fluorspar were 44% less than in 1930 and were 57% below the average for the 5-year period 1926-1930. Imports into the United States in 1931 were 68% less than in 1930 and were 67% below the average for the 5-year period 1926-1930. The average selling price of fluorspar sold by domestic producers to steel plants in 1931 was \$1.97 a ton less than in 1930 and \$2.12 a ton below the average for the preceding five years.

In 1931 fluorspar was produced at 47 mines or prospects in the United States, which yielded an equivalent of approximately 55,000 short tons of merchantable fluorspar. In 1930, 65 mines or prospects were worked, yielding approximately 130,000 tons of merchantable fluorspar. Fluorspar was produced in Colorado, Illinois, Kentucky, Nevada, and New Mexico.

Shipments of fluorspar from mines in the United States in 1931, amounting to 53,455 short tons, consisted of 44,463 tons of gravel fluorspar; 1637 tons of lump fluorspar, and 7355 tons of ground fluorspar. The general average value for all grades per ton f.o.b. mine shipping points was \$17.41, 81 c. less than the 1930 average. The general average value of the fluorspar shipped to steel plants in 1931 from the Illinois-Kentucky district was \$14.23 a ton, compared with \$16.99 a ton in 1930.

Domestic producers shipped 48% less fluorspar to steel plants and 50% less fluorspar to foundries in 1931 than in 1930. In the ceramic industries the shipments of fluorspar to manufacturers of enamel and cement decreased 9% and 59% respectively. The shipments to manufacturers of glass, however, chiefly makers of fruit jars, increased 67%, due to the abundant fruit crop and the consequent demand for fruit jars and fruit-jar liners. The shipments of acid-grade fluorspar from domestic mines in 1931 were 55% less in 1931 than in 1930.

Stocks of fluorspar at mines or at shipping points on December 31, 1931, consisted of 58,377 short tons of gravel fluorspar, 3687 tons of lump fluorspar, and 477 tons of ground fluorspar, a total of 62,541 tons of "ready-to-ship" fluorspar. In addition there was in stock piles at the close of 1931 about 43,000 tons of crude (run-of-mine) fluorspar equivalent to 21,000 tons of merchantable fluorspar. These stocks compare with 56,476 tons of "ready-to-ship" fluorspar and 53,000 tons of crude fluorspar on December 31, 1930.

The imports of fluorspar into the United States in 1931 amounted to 20,709 short tons, valued at \$211,435, a decrease of 68% in quantity and 61% in total value from 1930.

# The Volume Delusion

## Costs for Normal Volume of Business Vary But Little Over Wide Range

By J. C. Buckbee

J. C. Buckbee Co., Engineers, Chicago, Ill., and president of the Northern Gravel Co., Barton, Wis.

EVERY sand, gravel, crushed stone, or cement plant operator, after a year or so of experience with a property, knows its comfortable capacity or how many carloads of material can be produced day after day. Every operator knows also that uniform, steady operation of any enterprise gives the best returns in the long run.

However, not so many operators know to what extent costs are affected by running below or above normal operating capacity. Many are deluded into making low prices in order to get additional tonnage by the thought that such tonnage will materially reduce costs and thereby materially increase profits. Frequently, just the opposite, that is, reducing tonnage by refusing low priced business, will increase profits. In every instance a study should be made before a reduced price is made or accepted, to determine what the ultimate result is going to be.

The fixed charges of every operation, that is, depreciation, taxes, insurance, office salaries and expenses, salesmen's salaries and expenses, etc., go on every day, almost irrespective of output and to a large extent are the determining factors in fixing the cost for any rate of output. Labor, power, supplies and repairs vary as the output varies and can be regarded as a constant cost per ton or yard of output—at least for such normal variations of output as we shall consider in this discussion.

The fixed charges of a sand and gravel or crushed stone plant, when running at normal capacity, usually constitute 30 to 40% of the total cost; that is, if the total cost of washed sand and gravel produced at the normal rate of operation is 50c. per ton, the fixed charges will range around 20c. per ton; and the labor, power, supplies, repairs, etc., will run around 30c. per ton. Now let us see what happens to the cost if we run, first at 90% of normal capacity, and then at 110% and at 120% of capacity.

### Don't Be a Victim!

***IT IS our experience that almost every other producer of rock products is a victim of the "volume complex." He estimates it will cost so much to get out 50,000 tons, 100,000 tons, etc.; he then comes to the conclusion that with these costs fixed, and with a plant and organization capable of getting out 75,000, 150,000 tons, etc., he will have just so much "velvet" if he can increase his volume. Hence he goes out to get this extra volume at cut prices.***

***He should know by past experience that this extra volume at cut prices results eventually in ruinous competition, dragging down all his prices to the lowest level he quotes. But does he also realize that he is a victim of a great delusion in thinking that the extra volume he goes after does not cost him anything over and above his previously determined costs?***

***Mr. Buckbee has done the industry a genuine service in so clearly demonstrating the fallacy of this method of doing business. Nearly every other industry has clearer ideas of the volume delusion. Isn't it about time rock products producers saw the light?—The Editor.***

#### *Relation Between Output and Cost*

When variables are being considered, curves present the facts more clearly and quickly than tabulations; therefore, the computations of what happens to costs under different rates of operation have been plotted as a curve in the accompanying graph on the page following. From this curve it will be observed that if the output is reduced to 90%, the cost is raised about 5%; and if we increase the output to 110%, the cost is lowered about 3½%. If the output be stepped up to 120%, the cost is reduced only 7%, while the output can be reduced as much as 20% without increasing the cost over 10%. If we double shift the plant, run nights, and get 200% output (which, however, we cannot realize in actual operation, for night work is never as efficient as day work), we can reduce the cost only 20%. To increase the cost 20% we would have to reduce the output about 33%, or to two-thirds of normal.

Continuing, let us say a plant has a normal output of 2000 tons per 10 hours and the normal production cost is 50c. per ton; also, that the average selling price is 70c. per ton, and the market will readily take the output at such a price for 150 days annually. Then we have the following picture:

| | |
|---|---|
| 2000×150=300,000 tons sold @ 70c. = | $210,000 |
| 300,000 tons produced @ 50c. = | 150,000 |
| Gross profit = | $ 60,000 |

Now let us say business is slow and we refuse all but attractive orders, and, while the volume of such orders is only sufficient to run the plant at 90% of normal capacity, the average price is 5c. per ton higher than normal. Then we have the following picture:

| | |
|---|---|
| 300,000 × .90 = 270,000 tons sold @ 75c. = | $202,500 |
| 270,000 tons produced at 0.50 × 1.05 = 52.5c. = | 141,750 |
| Gross profit = | $ 60,750 |

Now suppose we decided to go out and get more business, whether we were fairly entitled to it or not, and to do so cut the price 5c. and increased the tonnage 10%. Then the curve shows that the picture would be as follows:

| | |
|---|---|
| 300,000×1.10=330,000 tons sold @ 65c. = | $214,500 |
| 330,000 tons produced @ 0.50× 0.965 = 48¼c. = | 159,000 |
| Gross profit = | $ 55,500 |

In this case we have actually lost $4500 by increasing our output 10%.

Now, say we decided to step up our business by operating 12 hours daily, thus increasing the output 20%, or to 360,000 tons annually, and to get this additional business we have to reduce the average price 7c. per ton. Then we have the following picture:

| | |
|---|---|
| 360,000 tons sold @ 63c. = | $226,800 |
| 360,000 tons produced @ 0.50× 0.93 = 46.5c. = | 167,400 |
| Gross profit = | $ 59,400 |

We have lost $600 and, what is worse, we have disturbed the market by cutting the price. While we only intended at the outset of our campaign to reduce the price 5c., we have taken considerable tonnage away from our competitors and, in their endeavors to regain this tonnage, they have cut the price still further, forcing us finally to a 7c. cut. In addition, we have started a price-cutting war, the end of which no one can see, as confidence has been disturbed, and the chances are that prices will be much lower the next year and that we will be back to our normal tonnage.

* * * * *

The curve shows us that there is less to be feared from reduced tonnage than we expected, and that the vision of an increase in profits through an increase in tonnage may

be a serious delusion. It further proves that holding up prices is the more certain road to profits.

While the curve has been extended down to 30% of normal and up to 200% of normal, it is probably none too accurate for conditions below 75% of normal or above 140% of normal. If business fell to 75% of normal, we would start cutting salaries and labor and other direct costs would rise faster than the curve contemplates; while, if we operated above 140% of normal, which would usually mean 14 hours daily, the efficiency of labor would be reduced or we would have some two-shift work, and maintenance work would be more difficult to care for and hence more costly.

For variations of tonnage 20% either side of normal, the curve gives a very accurate picture. The cost and selling figures are purely hypothetical and assumed merely for the purposes of illustration. The trend of the curve is the important fact that has been brought out and this will not vary greatly whether the fixed charges are 30, 35, 40, or even 45% of the total cost. That is, if the fixed charges are but 30%, the curve will be somewhat flatter, and if they exceed 40%, the curve will be somewhat steeper; but the trend shown is sufficiently accurate to give an executive a clear picture of what will happen to his costs if the output is increased or decreased.

## Illinois Cement Prices Bring Down Prices in Wisconsin

THE Wisconsin State Highway Commission will not buy from cement companies for the state highway program this year except at the lower prices which have resulted from a local price war in Illinois, it was announced recently.

While the commission contracted last November for more than 1,000,000 bbl. of cement at a higher price, Chairman Thomas J. Pattison said that unless it can secure adjustments to the Illnois price it will require the contractors to furnish cement on the jobs they are awarded because they will be able to buy cheaper than the state.

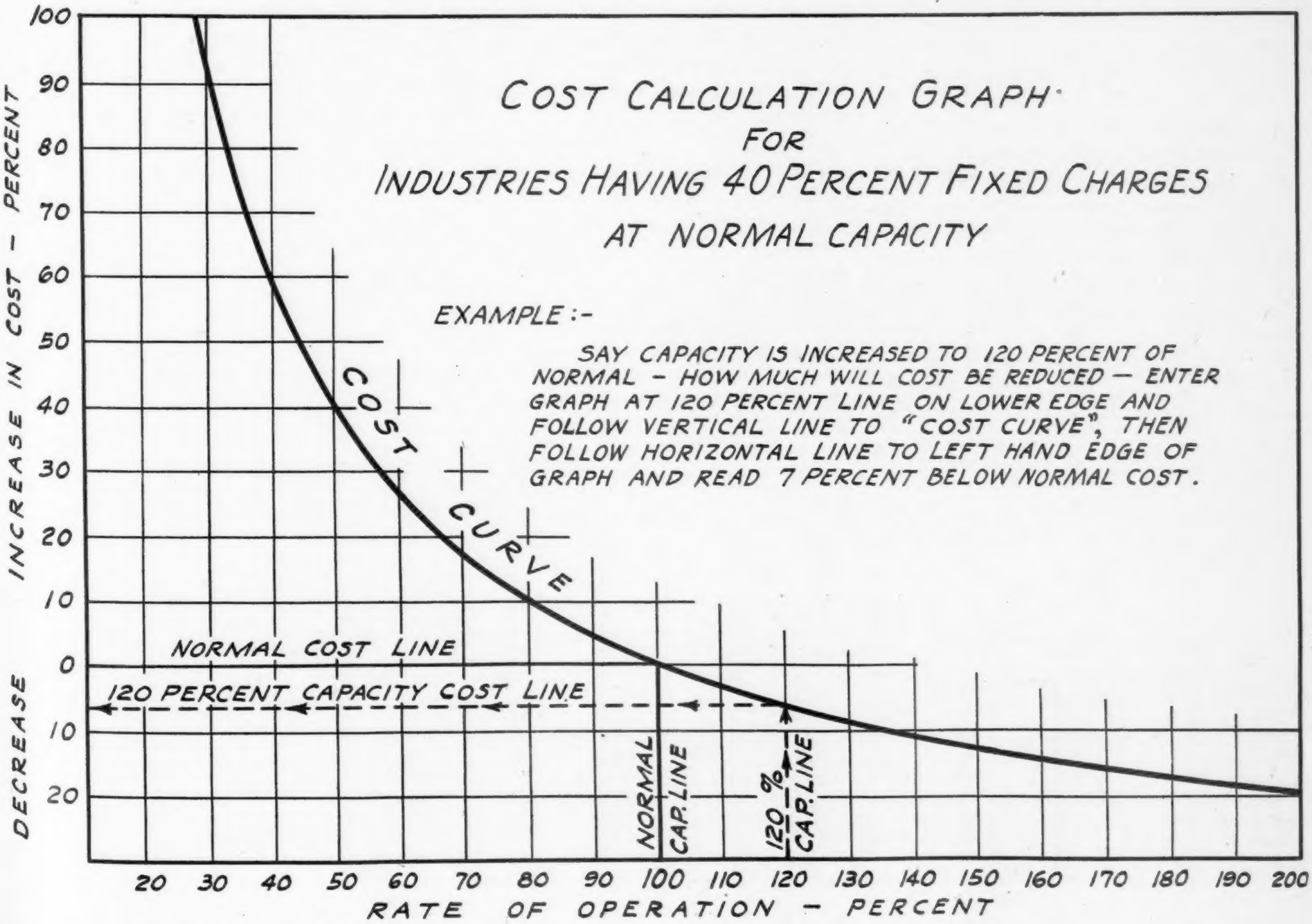
"To assist in stabilizing industry and relieving unemployment," he asserted, "the Wisconsin Highway Commission, following the policy of Minnesota and Iowa, received bids on 1,150,000 bbl. on November 28, 1931. All mills quoted the same price, uniform with the bid in Minnesota and Iowa. The Manitowoc Portland Cement Co. operates the only cement mill in Wisconsin and employes 160 men. The commission allotted 37%, or 425,000 bbl., to this mill.

"Early in January, Illinois took bids on 5,000,000 bbl. of cement. The unusually large quantity precipitated a local price war, resulting in lower bids than those received by Minnesota, Wisconsin and Iowa. The Alpha Portland Cement Co. was low bidder on 1,300,000 bbl. in Illinois and immediately advised our commission that they would fill their Wisconsin order on the basis of their Illinois bid. This was approved by the commission and immediately steps were taken for like adjustments with the other cement companies.

"The quantity of cement furnished by the Alpha Portland Cement Co. and other companies making like adjustments will be used on the first construction project of the season, and on the balance of the 1932 work the cement will be furnished by the contractors, who contend that they can buy the cement and other materials cheaper than the state."
—*Milwaukee* (Wis.) *Sentinel.*

### Capacity Defined

***EVERY OPERATOR knows or should know that his plant and his organization have a normal operating capacity at which they function most efficiently. That is not generally, if ever, the highest possible capacity. It may be only half the reputed "capacity" of the plant. It follows of course that a plant need not operate at so-called capacity in order to operate with the lowest possible costs. — The Editor.***



# Grinding Plant Research*

## Part IV—Tests of Coal Grinding Mills

By William Gilbert

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THE machines used for coal grinding at most of the English cement plants during the test periods were kominors and tube mills, or compound tube mills. Griffin mills, and Bradley three roll mills were also used (although tests on them are not included in Table III) and some particulars of the new surface produced by them will be given later.

### *Coal Grinding at Wouldham*

The test about to be described was made on a coal grinding mill at the Wouldham Works of the British Portland Cement Manufacturers Ltd., Grays, Essex. The plant contained a kominor and a tube mill used in connection with one 260-ft. kiln. The mill dimensions, and the chief test results, are shown in Line IV of Table III, Part III. Additional particulars are as follows:

*Data on Kominor.* Stepped lining plates of the standard type were used, the minimum diameter inside being 62¾ in., and the maximum diameter 74¼ in. In Fig. 18 the average diameter of 68½ in. is used for calculation purposes.

The charge consisted of 45 cwt.† of steel balls ranging from 1⅝ in. to 2⅝ in. diameter. The material left the grinding drum by three rectangular openings which communicated with three circular screens. The openings rapidly choked with pieces of iron, and damp coal, and required to be cleared weekly. There were three slotted circular screens 16½ in. diam. by 40 in. long. The slots (with rounded ends) were 13/32 in. long and 5/64 in. wide, the total area through them being 19.3 sq. ft. There were no fine screens.

In Fig. 18 the screens, marked *S*, are indicated in diagram form only. Experiments indicated that their actual shape had little influence on grinding results.

*Tube Mill, Flint Stone Chamber.* The charge consisted of 167 cwt.† of flints which ranged from 28 to 1.3 oz. in weight, the average being 6.8 oz. Both compartments of the tube mill were lined with silex blocks. There was a diaphragm plate between the flint stone chamber, and the cylpeb chamber, as shown at *AB* in Fig. 19. The slots in the diaphragm plate were 1/16 in. wide, the total area through them being 91 sq. in. The space around the mill center line was blank, the radius to the nearest slot being 15 in. The slots extended nearly to the circumference.

*Tube Mill, Cylpeb Chamber.* The charge consisted of 75 cwt.† of cylpebs, mainly 9/16 in. diam. and 13/16 in. long, the average weight being 0.9 oz. The mill discharged through periphery ports, but there was an intermediate diaphragm plate at *CD*, Fig. 19. It was generally similar to that at *AB*, except that the area through the slots was 103 sq. in.

### *Details of Test*

The coal was bituminous slack, containing 19.5% of ash, the calorific value being 11,400 b.t.u.'s per lb., dry. The moisture in the ground coal was 2.2%. The coal grinding mill and the kiln were tested together for three days, and afterwards for one week. The raw coal was weighed in barrow loads of 3 cwt.† over a platform weighing machine and a small sample was taken from each barrow. The total weight of coal used, reckoned dry, was thus obtained.

Revolution counters were fixed to the kominor and to the tube mill, and the total number of revolutions made by each mill during the test was recorded. The running time was obtained by dividing the counter readings by the average r.p.m. of each mill. Samples of equal weight were taken hourly of coal entering the kominor, the coal leaving the kominor and the coal leaving the tube mill. The samples were placed in covered tins, and, after mixing, a sieve test was made on the average sample from each tin every 8 hours. The 8-hour results were

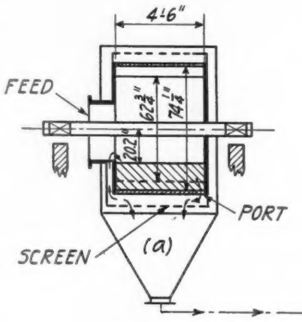


FIG. 18

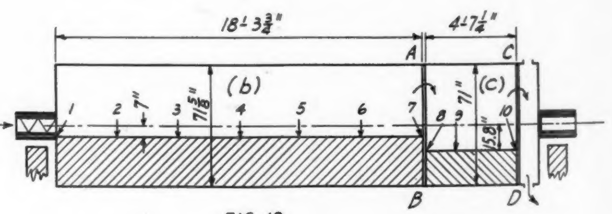


FIG. 19

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†112 lb., based on English ton of 2240 lb.

TABLE IV—TEST OF COAL GRINDING

| Test periods | Mill running time, min. | Moisture in coal: Leaving dryer, per cent. | Moisture in coal: Leaving tube mill, per cent. | Coal entering kominor, percentage residues on: 1 in. | ½ in. | ¼ in. | 10 mesh | 20 mesh | 50 mesh | 76 mesh | 100 mesh | 180 mesh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| First 24 hours | 980 | 5.2 | 2.5 | ...... | 19.3 | 29.8 | 47.7 | 63.3 | 87.1 | 93.6 | ...... | ...... |
| Second 24 hours | 986 | 4.7 | 2.2 | 15.7 | 21.1 | 29.3 | 46.8 | 58.5 | 81.5 | 89.6 | ...... | ...... |
| Third 24 hours | 1080 | 5.8 | 3.3 | 5.1 | 17.1 | 32.8 | 52.9 | 69.4 | 87.6 | 93.5 | 97.3 | 99.0 |
| Fourth 24 hours | 873 | 2.8 | 1.7 | ...... | 18.1 | 38.9 | 71.6 | 86.5 | 94.0 | 96.4 | ...... | ...... |
| Fifth 24 hours | 1146 | 4.2 | 2.1 | 7.3 | 28.6 | 47.8 | 72.7 | 86.0 | 91.0 | 93.4 | ...... | ...... |
| Sixth 24 hours | 898 | 4.1 | 2.2 | .... | 21.1 | 39.8 | 77.9 | 90.6 | 96.4 | 97.3 | ...... | ...... |
| Seventh 24 hours | 865 | 3.3 | 1.7 | ...... | 11.6 | 33.0 | 61.1 | 75.6 | 90.8 | 94.5 | 97.0 | 98.1 |
| Eighth 24 hours | 926 | 2.9 | 1.3 | 17.1 | 28.6 | 32.8 | 59.0 | 72.8 | 88.4 | 92.9 | ...... | ...... |
| Ninth 24 hours | 1012 | 3.9 | 2.3 | ...... | 10.3 | 28.2 | 65.9 | 83.6 | 96.0 | 97.8 | ...... | ...... |
| Tenth 24 hours | 977 | 4.0 | 2.3 | 7.6 | 29.1 | 46.1 | 76.7 | 88.7 | 96.7 | 98.0 | ...... | ...... |
| | Hours 162.4 | 4.1 | 2.2 | 5.3 | 20.5 | 35.9 | 63.2 | 77.5 | 91.0 | 94.7 | 97.1 | 98.6 |

averaged for the 24-hour results, which are shown in Table IV. The speeds of the kominor and tube mill were taken at frequent intervals daily for each mill.

The kominor was driven from a line shaft, which was in turn driven by an 85-hp. motor. A 200-hp. motor operated the coal dryer and the tube mill. The latter was provided with a friction clutch on the pinion shaft. In both cases measurements were taken about six times daily of the electrical power supplied to the motor under full load, and again when the mill had been disconnected and in that way the power required to drive each mill was obtained. The following results were obtained:

Coal ground per hour, dry....................4.32 tons
Residue on 180 mesh sieve....................13.0%
Power consumed per ton ground per hour ....................40.6 hp.
Power consumed per ton ground per hour referred to a residue of 15% on 180 mesh....................38.6 hp.

The daily averages of the sieve tests, the kominor and tube mill speeds and the horsepower measurements are shown in Table IV.

### *Axial Sieve Test*

During the test period the kominor and the tube mill were stopped when on normal feed and samples of the grit coal were taken in the positions marked 1 to 7 along the flint stone chamber, and in the positions marked 8 to 10 along the cylpeb chamber (Fig. 19). The sieve test results are shown on the graph in Fig. 20.

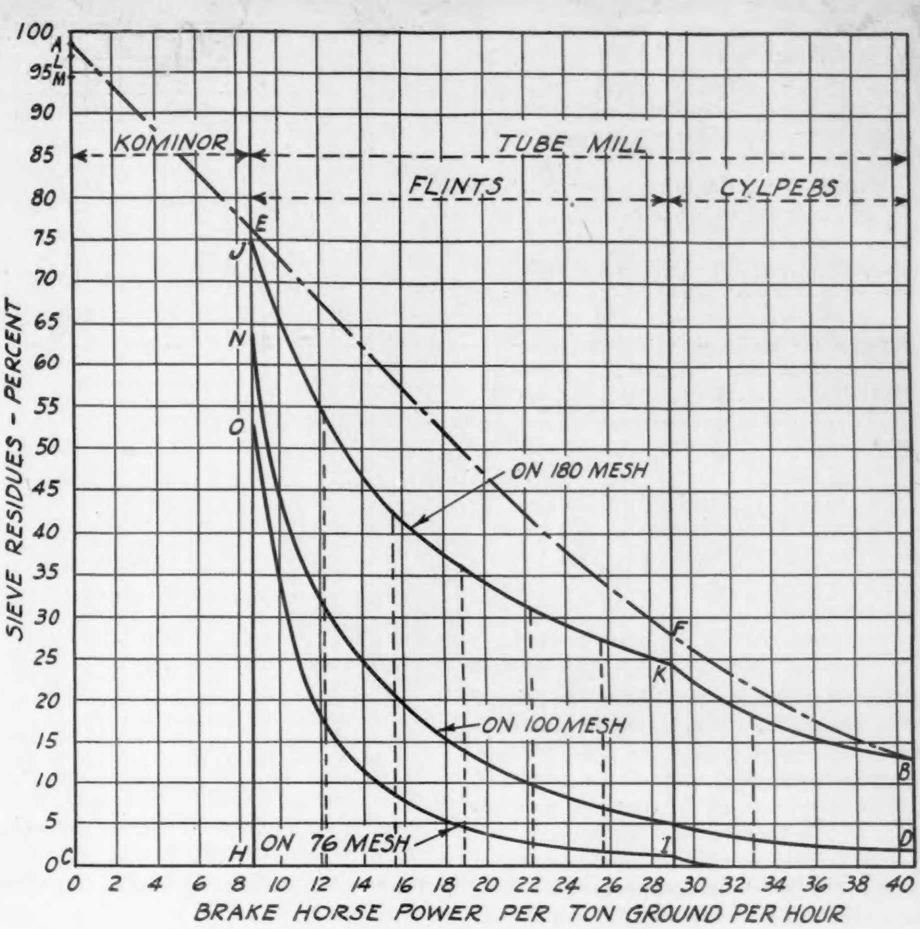


*Fig. 20—Graph of grinding results at Wouldham Works*

From Table IV the coal entering the kominor had an average residue of 98.6% on 180 mesh, and the coal leaving the tube mill had an average residue of 13% on 180 mesh. Ordinates at these residues were drawn on the reference curve shown in Fig. 16 and the portion of the curve coming between these ordinates was applied to the graph in Fig. 20, where it is marked *AEFB*, the horizontal scale of the part of the curve taken from Fig. 16 being suitably modified.

The reference curve was obtained by grinding a definite quantity of standard sand, with 1 in. diam. steel balls, in an 18 in. diam. experimental mill, the conditions being uniform and suitable.

When the tests on the various coal grinding plants were nearly complete, it was recognized that a sample of the coal actually used in each case should have been ground in the experimental mill at the same time. It might be necessary to use balls somewhat larger than 1-in. diam. for the first 250 revolutions, in order to deal with coal lumps similar to those which entered the kominor. By making each small scale test under identical conditions, the number of mill revolutions required to grind each sample of coal to a residue of, say, 10% on 180 mesh would have furnished a hardness factor, by means of which the actual performance of the coal grinding plants could have been better compared. The method outlined above would allow for the initial disintegration of the coal when it occurred.

The reference scale obtained during the experimental mill test in each case (which connects power supplied and residue on 180 mesh) could also have been applied to the corresponding axial sieve test.

Returning to the axial sieve test shown on Fig. 20, the power scale *CHID* is obtained as follows:

$$\text{For the kominor } CH = \frac{37.6}{4.32} = 8.70$$

The tube mill took 138 b.h.p.—this quantity requiring to be divided betwen the flint stone chamber and the cylpeb chamber. In the calculations which follow the weight of the grinding bodies only is used since the weight of the material present could not conveniently be obtained.

The error in the subdivision of the b.h.p. between two compartments of a tube mill, when the material weight is omitted, is usually found to be small.

INDING MILL AT WOULDHAM

| | Coal leaving kominor, percentage residues on | | | | | | Coal leaving tube mill, per cent. residue on | | | Revolutions per min. | | Brake horsepower | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 180 mesh | 10 mesh | 20 mesh | 50 mesh | 76 mesh | 100 mesh | 180 mesh | 76 mesh | 100 mesh | 180 mesh | Kominor | Tube mill | Kominor | Tube mill |
| ...... | 0.4 | 8.4 | 40.0 | 55.0 | 65.8 | 76.5 | 0.8 | 1.6 | 11.1 | 23.8 | 22.0 | ...... | 137.5 |
| 99.0 | 0.3 | 7.4 | 37.0 | 57.4 | 61.8 | 72.6 | 0.8 | 1.6 | 11.3 | 23.8 | 21.9 | ...... | 134.6 |
| ...... | 0.4 | 8.4 | 40.0 | 55.2 | 66.1 | 76.8 | 0.7 | 1.7 | 13.4 | 23.8 | 22.0 | ...... | 136.0 |
| ...... | 0.4 | 8.5 | 40.0 | 55.1 | 66.1 | 77.0 | 0.9 | 1.9 | 12.4 | 23.5 | 22.0 | ...... | 141.6 |
| ...... | 0.4 | 7.1 | 33.7 | 46.6 | 56.7 | 66.9 | 0.8 | 1.9 | 13.6 | 23.6 | 22.1 | 37.9 | 140.2 |
| 98.1 | 0.4 | 7.8 | 38.7 | 53.3 | 64.1 | 75.1 | 0.7 | 1.8 | 14.0 | 23.8 | 21.9 | 37.8 | ...... |
| ...... | 0.4 | 8.2 | 38.5 | 53.2 | 63.7 | 74.9 | 0.8 | 1.9 | 14.0 | 23.5 | 21.7 | 38.0 | ...... |
| ...... | 0.5 | 8.9 | 40.1 | 55.2 | 65.8 | 76.6 | 0.7 | 1.7 | 13.7 | 23.9 | 21.9 | 38.4 | ...... |
| ...... | 0.4 | 8.1 | 39.3 | 54.2 | 65.1 | 76.4 | 0.9 | 1.8 | 12.5 | 23.7 | 21.7 | 37.1 | ...... |
| — | 0.4 | 8.6 | 40.2 | 54.7 | 65.5 | 76.5 | 0.9 | 1.9 | 13.9 | 23.9 | 22.0 | 36.7 | ...... |
| 98.6 | 0.4 | 8.2 | 38.8 | 53.4 | 64.0 | 74.9 | 0.8 | 1.8 | 13.0 | 23.7 | 21.9 | 37.6 | 138.0 |

From F(8) in Part I we have:
b.h.p. for tube mill

$$= \frac{\overset{(b)}{Wo \times N \times Rg}}{P_0} + \frac{\overset{(c)}{Wo \times N \times Rg}}{P_0} = 138$$

Putting in the numerical values from line IV in Table III we obtain:

$$\frac{\overset{(b)}{167 \times 21.9 \times 19.1}}{P_0} + \frac{\overset{(c)}{75 \times 21.9 \times 24.2}}{P_0} = 138$$

Solving the equation it is found that $P_0$ .......... = 793
also, b.h.p. for flint stone chamber $(b)$ .......... = 88.0
and b.h.p. for cylpeb chamber $(c)$ .. = 50.0

Total b.h.p. .......... = 138.0

Hence on Fig. 20:

$$HI = \frac{88.0}{4.32} = 20.4, \text{ and}$$

$$ID = \frac{50.0}{4.32} = 11.6$$

*Kominor Efficiency.* Since the point $J$ falls below the point $E$ it may be considered that the efficiency of the kominor was slightly better than that of the tube mill. At the conclusion of this test average samples of the coal leaving the kominor and the tube mill were each divided into several grades by sedimentation, and microscopic measurements were made of the particle size in each grade. It is proposed to deal with this subject later, but the result may be stated here:

| | Sq. ft. |
|---|---|
| (a) New surface produced by kominor per b.h.p. hour.......... | = 137.200 |
| (b) New surface produced by tube mill per b.h.p. hour.......... | = 114.800 |

Compared in this way the relative efficiencies of the kominor and the tube mill are as 100 to 83.5.

Since the above experiment was made it has been pointed out that the microscope used was probably not powerful enough to identify the smallest particles produced by the tube mill, a portion of which would be less than .0001 in. in diameter.

Hence if the experiment was repeated, with a more powerful microscope, it may be that the new surface produced per b.h.p. hour by the tube mill would be found equal to, or greater, than the new surface produced per b.h.p. hour by the kominor.

It is unfortunate that an axial sieve test was not made on the kominor, since the extent to which the coal disintegrated, on entering the mill is now not known. In some kominor tests the initial disintegration was considerable.

*Tube Mill Flint Stone Chamber.* On the graph showing the axial sieve test, Fig. 20, the curves denoting residues on the 180, 100, and 76 mesh sieves, fall sharply as the coal enters the tube mill, leading to the impression that the kominor itself may not have done much grinding. This effect is less marked in other axial sieve tests, to be described later.

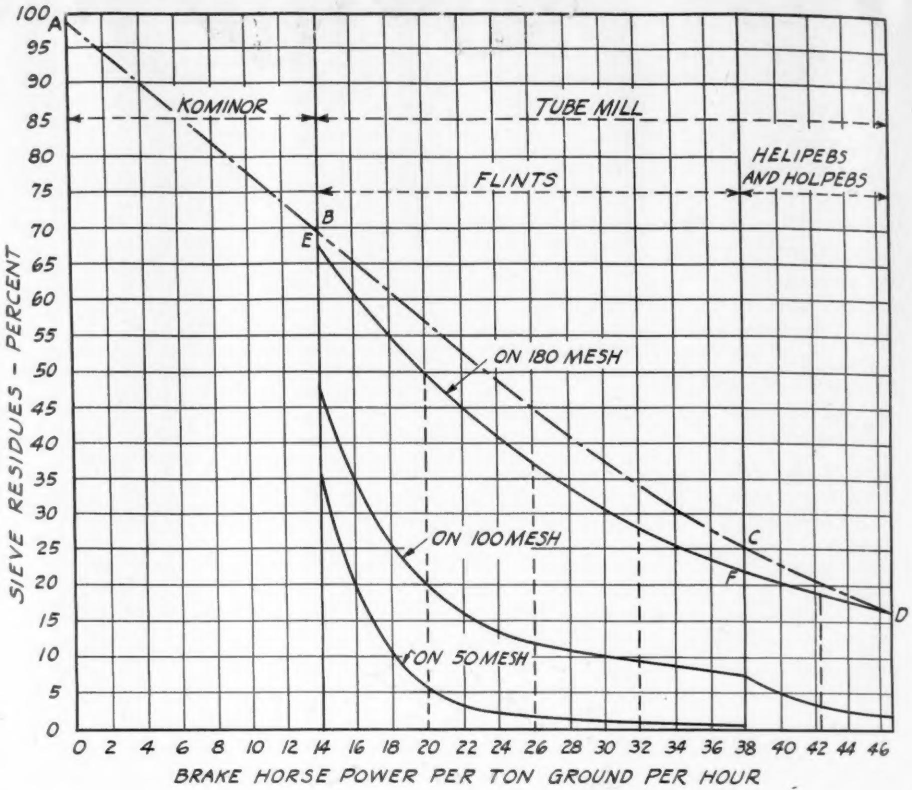



**Fig. 21—Graph of grinding results at Wilmington Works**

The flint stones were exceptionally large for coal grinding in a 6-ft. diam. tube mill, thus pointing to some loss of efficiency.

*Cylpeb Chamber.* The overall efficiency of the chamber as estimated by the reference line, is somewhat less than that of the flint stone chamber. Referring to Line IV in Table III it will be seen that the charge volume was 22.5%, and the speed factor 184. Subsequent trials on the experimental mill showed that for the above charge ratio, the speed factor should have been about 215, in which case the grinding efficiency of the cylpebs would have been increased by nearly 30%.

### Test of Coal Grinding for Kiln III at Wilmington, Hull

This test was at the works of Messrs. G. and T. Earle, Ltd., on a kominor and a tube mill used in connection with one 200-ft. wet process rotary kiln. The mill was large enough to supply a second kiln later.

The mill dimensions and the test results are shown in Line V of Table III, Part III. Additional particulars are given below and in Fig. 21.

*Data on kominor.* The mill was provided with a stepped lining of standard type. The charge consisted of 40 cwt.† of steel balls, of various sizes, chiefly 1⅜ in., 2¼ in. and 4⅜ in. diam., the corresponding weights being 0.4, 1.6, and 12.6 lb. To allow the material to pass from the end of the grinding drum to the screens, ten ports were provided, but only three were in use. They were partly closed due to the hammering action of the balls but the port area available was considered sufficient. The mill was provided with circumferential screens. The coarse screens had ½x¼ in. openings with rounded ends, and the fine screens had 10 meshes to the inch.

*Tube Mill, Compartment (b).* The compartment was lined with silex blocks, which were in good condition. The charge consisted of 101 cwt.† of flints, of various sizes, ranging from ⅞ to 9¼ oz., the average size being 3½ oz. The compartment discharged through a diaphragm plate similar to that marked $AB$ in Fig. 19. The plate contained 270 slots, 4x5/16 in., the total area being 338 sq. in.; the edges were somewhat burred over. The slots reached to within 1¼ in. of the circumference of the mill, but there was a blank space at the center of the plate, the radius to the nearest slot being 15 inches. By F(6) in Part I the volume of the voids was $\frac{101 \times 112}{224} = 50.5$ cu. ft. The volume of the material taken from the compartment, as measured, was 19.6 cu. ft. Hence, the ratio of the material volume to the void volume was 38.8%.

*Tube Mill, Compartment (c).* The lining was of silex blocks. The grinding bodies consisted of 38 cwt.† of holpebs and helipebs mixed. The average holpeb weighed 1.36 oz. and the average helipeb 1.04 oz. There was a diaphragm plate similar to that at $CD$ in Fig. 19. Passing the diaphragm plate, the material was discharged through periphery ports of ample area.

One cubic foot of the mixed helipebs and

holpebs, as taken from the mill, and separated from the coal grit, weighed 173 lb. The volume occupied by the steel would be $\frac{173}{490} = 0.354$ cu. ft., hence the voids were 64.6% of the charge volume.

The charge volume as measured in the mill was 24.6 cu. ft. so that the weight of the grinding bodies, per cu. ft. of charge volume, was $\frac{38 \times 112}{24.6} = 173$ lb., which is the same as the result obtained from the cubic foot box. Hence in compartment (*c*) the voids were also 64.6% of the charge volume, or 15.9 cu. ft.

The volume of the coal grit (which weighed 37 lb. per cu. ft.) was 9.9 cu. ft., hence the ratio of the material volume to the volume of the voids, was $\frac{9.9}{15.9} \times 100 = 62\%$.

### Test Details

The coal was a mixture of bituminous slack with 9.3% of ash and a calorific value of 13,460 B.t.u. per lb. and hence of relatively good quality. The coal dryer reduced the moisture from 3.31 to 1.92%.

The coal grinding mill was tested for one week together with the kiln. The raw coal was delivered in railway trucks, from which it was weighed out in barrow loads of 2 cwt.† A small sample for moisture determination was taken from each barrow, which was then tipped to the coal dryer elevator. A suitable correction was made for the moisture in the raw coal in order to obtain the total weight of coal used, reckoned dry.

Revolution counters were fixed to the kominor, and to the tube mill, and the record in each case was divided by the average r.p.m. of the mill, thus giving the actual running time.

The coal dryer and the coal mills were driven by a 175 hp. motor. Measurements were made of the power supplied to the motor at full load, and with either the kominor or the tube mill off, and the power used in each case was then calculated. Sampling was done as previously described.

The actual running time of the coal grinding mill was 136 hr. 5 min.; since it was too large for one kiln, it was closed down at the week-end.

The material showed the following fineness:

(Per cent. of material remaining on sieve sizes)

| Sieve size | Entering Kominor | Leaving Kominor | Leaving Tube Mill |
|---|---|---|---|
| 1-in. sq. | 0.0% | .......... | .......... |
| ½-in. sq. | 12.6% | .......... | .......... |
| ¼-in. sq. | 25.3% | .......... | .......... |
| 50-mesh | .......... | 68.0% | .......... |
| 100-mesh | .......... | 49.0% | 2.0% |
| 180-mesh | .......... | 36.0% | 16.4% |

The following results were obtained:

Quantity ground per hour, dry...... 2.46 tons
Residue on 180 mesh.......................16.4%
Power consumed per ton ground per hour, as ground.....................46.7 hp.
Power consumed per ton ground per hour, referred to 15% on 180 mesh ......................................48.3 hp.

### Axial Sieve Test

The axial sieve test is shown in Fig. 21. The hp. per ton ground per hour for each mill is obtained from Cols. 21 and 27 of Line V in Table III, Part III. The hp. is divided between the two compartments of the tube mill by F(8)A in Part I, taking into account the weight of the material, and using data given in Table III, as follows:

$$\text{hp.} = \frac{\overset{(b)}{108.87 \times 27.5 \times 16}}{P_m} + \frac{\overset{(c)}{41.26 \times 27.5 \times 15.7}}{P_m} = 80.6$$

Solving the equation with $P_m = 814$, we have:

Power for flint stone chamber, (*b*) = ..............................................58.8 hp.
Power for helipeb chamber, (*c*) = 21.8 hp.

Total = ..............................................80.6 hp.

If the calculation is made, omitting the weight of the material in the mill (and this is not always known) the value of $P_o$, the corresponding constant, is found to be 755, and the power then divides up as follows:

Power for flint stone chamber = 58.9 hp.
Power for helipeb chamber =........ 21.7 hp.

Total = ..............................................80.6 hp.

Hence the result is nearly the same in either case.

Returning to Fig. 21 the reference line *ABCD* is obtained from Fig. 16 in the manner already described.

The axial sieve test was not taken along the kominor, since the material inside the grinding drum is partly composed of new feed, and partly of the rejections from the screens, so that a sample of the material at the end of the drum, which is about to leave by the ports through the lining plates, would show a less percentage on 180 mesh than the material leaving the kominor outlet, since the latter has had the coarse material screened out of it.

It was seen later, however, that by measuring the proportion which the screen rejections bore to the new feed, an axial sieve test taken along the kominor could be suitably rectified.

From the graph the efficiency of the flint stone chamber appears to be slightly greater than that of the kominor, or of the helipeb chamber, but it will be remembered that the reference line refers to the grinding of standard sand of uniform hardness, and not to coal.

The mill gave a poor result. Most of the balls in the kominor were far too large, and for coal which had been screened through 10 mesh, most of the flints in the tube mill were also far too large.

Since only one kiln was installed, it was operating at considerably less than the normal rate of feed, hence the coal should have been ground much finer than it was. study of Line V in Table III does nc , however, yield sufficient reason for the low efficiency of the mill, hence it is assumed that the coal must have been especially difficult to grind.

*(To be continued)*

## Properties of Portland Cement Flour

THE results of some experiments to determine the properties of portland cement flour are given by J. H. Jennings, chief chemist, Australian Cement, Ltd., in the March issue of *Cement and Cement Manufacture*.

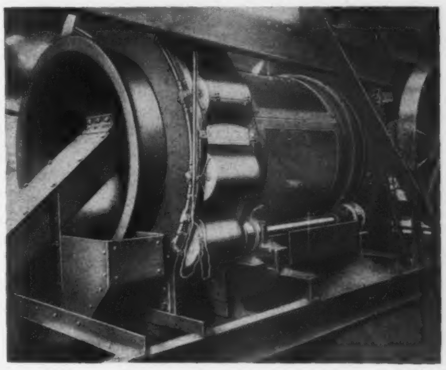
A standard air elutriator of the obscurometer type and also a Federal air separator were used and flours of minus 10 micron size obtained. The tests showed that the finest particles gave the greatest strengths. Chemical analyses of the flours showed marked differences from those of the clinkers from which they were made and also indicated easier grinding with higher lime content.

## Magnetic Separators

WHEN materials are ground in mills having rollers on rotating hammers it is important that pieces of tramp iron be removed.

According to a recent article in *Crushing and Grinding*, London, England, the separation of magnetic material from large quantities of sand may be done effectively in a rotary screen equipped with magnets as indicated in the accompanying illustration.

This has magnetic fingers or feelers which comb through the material, pick out the



***Rotary-screen type magnetic separator***

pieces of metal and carry them to an upper position, where they fall into a chute. When the sand is dry the magnetic separators are applied at the feed end of the screen, but if the moisture exceeds 5% it is better to sieve the sand first and separate it afterward to avoid clogging.

This rotary-screen type of separator has no wearing parts. A double-pole quick acting switch and non-inductive resistance is used to prevent destructive inductive effects in the coils.


# Dusting of Portland Cement Clinker

By Alton J. Blank

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DUSTING of portland cement clinker, while of rare occurrence in the majority of cement works, and consequently of minor importance, is nevertheless a subject of great interest to the cement plant chemist, and a great deal of research in a large number of laboratories has been undertaken with the object of determining the cause of this phenomenon.

Le Chatelier[1] (Recherches experimentales sur le Constitution des Ciments hydrauliques, 1887) was probably the first scientist to attribute the dusting of portland cement clinker to the presence of dicalcium silicate. Erdmenger[2] (*Tonindustrie Zeitung*, 1893) was of the opinion that cement clinker if taken hot from the kiln would, while cooling, fall to dust either from being burned from an over-clayed mixture, or if from a normal one, by over-burning.

Rankin[3] (*Journal of Industrial and Engineering Chemistry*, 7, 466, 1915) after considerable research in the Geophysical Laboratory on the "dusting" phenomenon, wrote as follows: "Compound dicalcium silicate is formed by crystallizing a melt of the composition $2CaO{\cdot}SiO_2$ (by weight 65% CaO and 35% $SiO_2$) though it will also form at temperatures much below its melting point, which is 2130 deg. C. It occurs in four forms: $\alpha$, which is stable between 2130-1420 deg. C.; $\beta$, which is stable between 1420-675 deg. C.; $\gamma$, which is stable below 675 deg. C.; and $\beta'$, which is unstable or monotropic and is usually found in charges rapidly cooled from a temperature of about 1400 deg. C. The change $\beta$ to $\gamma$ at a temperature of 675 deg. C. is accompanied by a volume change of about 10%, which shatters the crystals; this is the phenomenon commonly known as "dusting." Of these four forms, the high temperature forms of $\alpha$ and $\beta$ are the more common in portland cement. Rankin[4] (C.M.S. *Concrete*, February, 1920) writing further of his investigations during the period 1906-16 added the following: "Dusting of a cement clinker is a shattering of crystals of dicalcic silicate caused by the physical increase in volume when a high temperature form of this compound changes to a lower form of the same compound. It is known that "dusting" can be prevented by burning at a sufficiently high temperature in the kiln, if the raw mixtures are properly proportioned and ground.

Nacken and Dyckerhoff[4] (*Zement*, S.626, 1924) after a series of studies concluded that the compound 2CaO·SiO2 existed in three forms: $\alpha$, $\beta$ and $\gamma$ $2CaO{\cdot}SiO_2$, and that it is due to the difference in specific gravity between the $\beta$ and $\gamma$ forms of $2CaO{\cdot}SiO_2$ that clinkers disintegrate. Since then Kuhl and other scientists have advanced theories on the subject, some conflicting and others coinciding with the findings of Dyckerhoff.

That "dusting" of portland cement clinker occurs over a wide range of chemical composition is readily found in perusal of the somewhat scant literature that has appeared on the subject, and of the study given the "dusting" variety of clinker by the writer in the manufacture of cement from a variety of raw materials at a number of cement works.

Erdahl[5] (C.M.S. *Concrete*, March, 1919) reported clinker which had been burned at an apparent temperature of 2100-2200 deg. F. in the kiln, and which upon cooling dusted at once to a grayish-brown powder. The chemical composition of the clinker was as follows:

| | |
|---|---|
| $SiO_2$ | 26.60% |
| $Al_2O_3$ | 8.81 |
| $Fe_2O_3$ | 1.65 |
| MnO | 1.23 |
| CaO | 58.80 |
| MgO | 1.85 |
| $K_2SO_4$ | .28 |
| $K_2CO_3$ | .22 |
| $Na_2CO_3$ | .41 |
| $H_2O$ (absorbed) | .13 |
| L. R. | 1.58 |
| Molecular ratio | 1:1.74 |
| $SiO_2$ and $CaO/R_2O_3$ | 1:7.15 |
| When dusting occurred | At once |

Erdahl[6] (C.M.S *Concrete*, June, 1920) later reported several other dusting clinkers which he had prepared experimentally from sound and unsound, highly over-limed clinkers, by reburning these clinkers with an excess of silica at the high heat possible with an oxyacetylene torch. In his first test he selected an over-limed sound clinker of the following composition:

| | |
|---|---|
| $SiO_2$ | 17.76% |
| $Al_2O_3$ | 7.76 |
| $Fe_2O_3$ | 4.24 |
| MnO | .37 |
| CaO | 64.80 |
| MgO | 2.03 |
| $K_2O$ | .68 |
| $Na_2O$ | .22 |
| $SO_3$ | 2.06 |

This clinker on being burned with an excess of silica gave a characteristic dusting clinker. That clinker dust passing the 60-mesh sieve, and that retained on the No. 60 screen was analyzed, and showed the following composition:

| | Dusting part passing No. 60 screen | Non-dusting part retained on No. 60 screen |
|---|---|---|
| $SiO_2$ | 25.90% | 24.00% |
| $Al_2O_3$ | 13.50 | 12.30 |
| $Fe_2O_3$ | 4.40 | 5.70 |
| MnO | .19 | .19 |
| CaO | 54.22 | 56.14 |
| MgO | 1.45 | 1.45 |
| $K_2O$ | .14 | .10 |
| $Na_2O$ | .21 | .10 |
| $SO_3$ | nil | nil |
| L. R. | 1.23 | 1.33 |
| Mol. ratio | 1:1.25 | 1:1.48 |
| $SiO_2$ and $CaO/R_2O_3$ | 1:4.42 | 1:4.40 |
| Soundness | bad | bad |

In his second test Erdahl selected an over-limed unsound clinker of the following composition:

| | |
|---|---|
| $SiO_2$ | 16.80% |
| $Al_2O_3$ | 8.86 |
| $Fe_2O_3$ | 3.74 |
| MnO | .11 |
| CaO | 66.43 |
| MgO | 2.03 |
| $K_2O$ | .61 |
| $Na_2O$ | .56 |
| $SO_3$ | .88 |

This clinker on being reburned with an excess of silica gave a characteristic but

partial dusting clinker. Analyses of the dusting and non-dusting portions of the clinker are as follows:

| | Dusting portion | Non-dusting portion |
|---|---|---|
| $SiO_2$ | 26.16% | 19.50% |
| $Al_2O_3$ | 13.58 | 9.82 |
| $Fe_2O_3$ | 3.43 | 4.28 |
| MnO | .11 | .11 |
| CaO | 54.32 | 63.77 |
| MgO | 1.81 | 1.81 |
| $K_2O$ | .37 | .18 |
| $Na_2O$ | .24 | .52 |
| $SO_3$ | trace | trace |
| L. R. | 1.17 | 1.88 |
| Mol. ratio | 1:1.27 | 1:2.51 |
| $SiO_2$ and $CaO/R_2O_3$ | 1:4.70 | 1:5.86 |
| Soundness | bad | good |

Koyanagi[7] (Rock Products, November 22, 1930) reports a dusting clinker made in an experimental kiln, and gives the chemical composition of the dusting powder passing the 4900-mesh sieve, and the non-dusting portion as follows:

| | Powder passing No. 4900 sieve | Non-dusting particles |
|---|---|---|
| $SiO_2$ | 32.78% | 34.80% |
| $Al_2O_3$ | 4.14 | 1.13 |
| $Fe_2O_3$ | 1.25 | 5.50 |
| CaO | 61.71 | 58.85 |
| MgO | 1.04 | 0.81 |
| Loss | .26 | .02 |
| L. R. | 1.62 | 1.42 |
| Mol. ratio | 1:1.765 | 1:1.636 |
| $SiO_2$ and $CaO/R_2O_3$ | 1:17.53 | 1:14.12 |

Koyanagi made a series of experimental melts in the laboratory using several raw mixtures to which he added pure silica, and silica in the form of ground refractory bricks, and gave chemical composition of dusting mixtures as follows:

PLANT No. 1

| | Clinker No. 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| $SiO_2$ | 20.52% | 20.68 | 20.84 | 20.66 | 20.54 | 20.40 |
| $Al_2O_3$ | 7.39 | 7.04 | 7.23 | 7.28 | 7.31 | 7.21 |
| $Fe_2O_3$ | 2.95 | 3.02 | 2.79 | 3.08 | 3.15 | 3.09 |
| CaO | 56.06 | 57.72 | 59.44 | 61.73 | 63.66 | 64.41 |
| MgO | 12.28 | 10.91 | 9.31 | 7.05 | 5.19 | 3.74 |
| Loss (absorbed) | 0.18 | 0.22 | 0.18 | 0.14 | 0.22 | 0.28 |
| L. R. | 1.82 | 1.87 | 1.92 | 1.99 | 2.05 | 2.09 |
| Mol. ratio | 1:2.23 | 1:2.32 | 1:2.39 | 1:2.51 | 1:2.61 | 1:2.69 |
| $SiO_2$ and $CaO/R_2O_3$ | 1:7.40 | 1:7.79 | 1:8.01 | 1:7.95 | 1:8.05 | 1:8.23 |
| When dusting occurred | At once | At once | Less than 30 min. | 4 days | did not dust | did not dust |
| Soundness | Bad | Bad | Bad | Bad | O.K. | Bad |

PLANT No. 2

| | Clinker No. 1 | No. 2 | No. 3 | No. 4 |
|---|---|---|---|---|
| $SiO_2$ | 22.36% | 21.60 | 20.52 | 19.94 |
| $Al_2O_3$ | 11.62 | 10.54 | 9.10 | 7.39 |
| $Fe_2O_3$ | 4.48 | 3.66 | 3.04 | 2.59 |
| CaO | 56.70 | 59.20 | 62.11 | 64.82 |
| MgO | 3.86 | 4.23 | 3.97 | 3.78 |
| Loss (absorbed) | 0.44 | 0.28 | 0.36 | 0.41 |
| L. R. | 1.47 | 1.65 | 1.90 | 2.16 |
| Mol. ratio | 1:1.71 | 1:2.00 | 1:2.40 | 1:2.77 |
| $SiO_2$ and $CaO/R_2O_3$ | 1:4.91 | 1:5.69 | 1:6.80 | 1:8.49 |
| When dusting occurred | At once | At once | Less than 3 hours | Did not dust |
| Soundness | Bad | Bad | Bad | Bad |

PLANT No. 4

| | Kiln brick coating No. 1 | Coating No. 2 | Coating No. 3 | Clinker No. 1 | Clinker No. 2 |
|---|---|---|---|---|---|
| $SiO_2$ | 23.68 | 23.02 | 22.10 | 28.84 | 26.02 |
| $Al_2O_3$ | 11.62 | 5.40 | 6.44 | 7.21 | 9.01 |
| $Fe_2O_3$ | 2.88 | 1.38 | 2.06 | 3.01 | 4.11 |
| CaO | 57.47 | 51.17 | 49.25 | 55.37 | 54.04 |
| MgO | 1.97 | 17.90 | 19.08 | 2.51 | 2.20 |
| $SO_3$ | 1.98 | 0.92 | 0.85 | 1.64 | 1.81 |
| Loss | 0.06 | 0.10 | 0.12 | 0.78 | 1.86 |
| L. R. | 1.50 | 1.71 | 1.61 | 1.41 | 1.38 |
| Mol. ratio | 1:1.64 | 1:1.92 | 1:1.81 | 1:1.52 | 1:1.53 |
| $SiO_2$ and $CaO/R_2O_3$ | 1:5.59 | 1:10.94 | 1:8.49 | 1:8.24 | 1:6.10 |
| When dusting occurred | Within 2 hours | Within 2 hours | Within 2 hours | Less than 3 hours | Less than 8 hours |
| Soundness | Bad | Bad | Bad | Bad | Bad |

| | $2CaO{\cdot}SiO_2$ | $A_3$ | $B_4$ | $D_3$ | $E_4$ | $F_4$ | $C_8$ |
|---|---|---|---|---|---|---|---|
| $SiO_2$ | 35.08% | 31.33 | 29.93 | 28.15 | 27.21 | 26.78 | 24.50 |
| $Al_2O_3$ | ............ | 6.02 | 7.77 | 6.75 | 8.54 | 9.40 | 16.64 |
| $Fe_2O_3$ | ............ | 1.87 | 2.03 | 5.48 | 5.53 | 5.60 | 2.88 |
| CaO | 64.92 | 59.75 | 59.17 | 58.42 | 57.04 | 56.88 | 55.36 |
| MgO | ............ | 1.35 | 1.46 | 1.30 | 1.39 | 131 | 1.33 |
| L. R. | | 1.52 | 1.48 | 1.44 | 1.38 | 1.36 | 1.25 |
| Mol. ratio | | 1:1.68 | 1:1.63 | 1:1.68 | 1:1.58 | 1:1.54 | 1:1.21 |
| $SiO_2$ and $CaO/R_2O_3$ | | 1:11.5 | 1:9.09 | 1:7.07 | 1:5.98 | 1:5.57 | 1:4.09 |
| When dusting occurred | | 40 min | 1 hr. | 2 hr. | 4 hr. | 24 hr. | 3 days |

Koyanagi concluded that the higher the sesquioxide content and the lower the lime and silica contents, the longer is the time required for the clinker to begin dusting.

The writer's own experience with dusting clinkers made from a variety of raw mixtures at a number of cement works is shown in the accompanying tables.

The cause for the variation in the composition of the clinkers at Plant 1 was due to contamination of dolomite with the limestone being used to form the raw mixtures fed the kilns.

Clinkers 1 to 4 dusted to a greyish-white powder, clinker was in form of lugs for samples 1 to 3, while sample 4 was in the form of large balls.

The cause for variation in the composition of the clinkers at Plant 2 was due, in starting up the plant, in part to trial mixtures using a clay low in silica and high in lime, and a shale comparatively high in silica and devoid of lime content. High gas velocities carrying out large quantities of dust from the kiln was also a contributing factor.

Clinkers 1, 2 and 3 dusted to a greenish powder.

Clinker No. 1, Plant 3, was large in size, and its unusual composition was found to be due to absorption of alumina from kiln liners in burning zone.

Clinkers Nos. 2 and 3 were normal in size.

Clinker No. 1 dusted to a greyish powder, while clinkers 2 and 3 dusted to a yellowish powder.

Samples of kiln coating Nos. 1, 2 and 3 at Plant 4 were after a ring had been punched. Clinkers Nos. 1 and 2 were discharged from the kiln at the same time as were pieces of clay from kiln feed pipe.

PLANT No. 3

| | Clinker No. 1 | No. 2 | No. 3 |
|---|---|---|---|
| $SiO_2$ | 20.80% | 20.44 | 19.06 |
| $Al_2O_3$ | 13.52 | 7.22 | 7.28 |
| $Fe_2O_3$ | 3.24 | 2.56 | 2.34 |
| CaO | 58.44 | 63.93 | 65.22 |
| MgO | 2.04 | 2.41 | 2.22 |
| $SO_3$ | 0.73 | 2.07 | 1.87 |
| Loss | 0.80 | 0.68 | 1.40 |
| L. R. | 1.55 | 2.11 | 2.27 |
| Mol. ratio | 1:1.82 | 1:2.60 | 1:2.87 |
| $SiO_2$ and $CaO/R_2O_3$ | 1:4.72 | 1:8.62 | 1:8.76 |
| When dusting occurred | At once | 3 days | 3 days |
| Soundness | Bad | Bad | Bad |

Samples 1, 2 and 3 dusted to a white powder, while clinker samples 1 and 2 dusted to a greyish-green powder.

A summary of the results shown by the writer at the four plants in question would suggest that there are a number of factors which may cause the dusting of portland cement clinker, and that these factors may be different from one cement plant to the other. Therefore, laboratory tests with certain experimental mixtures and melts of materials, while interesting, do not solve the "dusting" phenomenon of portland cement clinker when any number of cement works using a variety of raw materials is taken into consideration.

# Hints and Helps for Superintendents

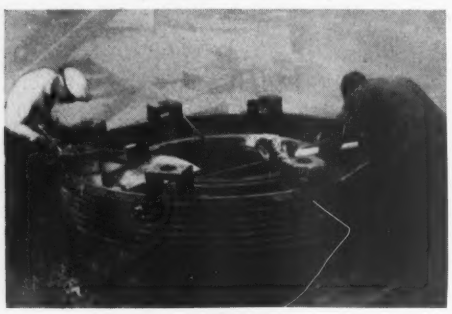
## Unusual Reclamation Job

RECENTLY at the plant of a rock products company, oxy-acetylene cutting with both the blowpipe and the oxygen lance and bronze-welding were effectively used to give a saving of over $2000 in the cost of getting a fractured rock crusher back in operation, *Oxy-Acetylene Tips* reports.

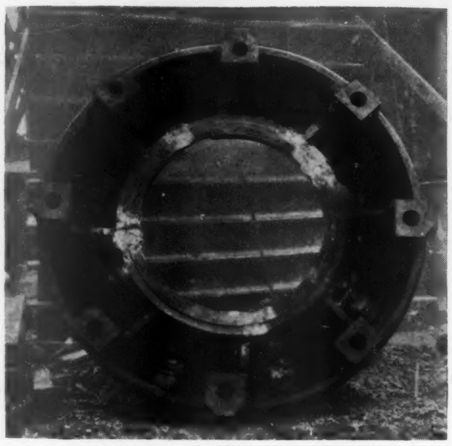
The bowl of a rock crusher which had been in constant operation had fractured in such a way that it locked in place. The plant officials called in an oxy-acetylene service operator for his opinion as to the possibility of welding the 8½ ft. diam., 8-ton cast steel crusher bowl. An inspection showed that in order to remove the fractured bowl it would have to be cut up into pieces. As another fractured bowl of the same size lay in the scrap heap, the service operator suggested that it would be more practical to reclaim the scrapped bowl than to repair the one that had just broken, particularly as all the cracks in the scrapped bowl extended to openings. Accordingly, his recommendation was that the locked bowl be removed by oxy-acetylene cutting and replaced by the scrapped bowl after reclamation by bronze-welding.

The bowl varied from 3 in. to 7 in. in thickness. There were four cracks each 26 in. long on the inner section, and on the bottom 11 cracks from 8 in. to 18 in. each in length. All the cracks were veed out to an included angle of 90 deg. by means of the cutting blowpipe, and the beveled surfaces were chipped to remove any oxide or slag that remained from the cutting. Chipping was extended back about ¾ in. from each edge of the vee so as to provide a suitable surface for the tinning action in reinforcing the bronze-welds.

A wood fire was then built around the casting in order to remove the chill. During the bronze-welding a preheating torch flame was played constantly on the opposite side from which the welders were working. All



*Bronze-welding crusher bowl*



*Crusher bowl reclaimed*

the cracks in the bottom section were welded first. These extended through the heaviest sections of the casting which were 7 in. thick. By following this procedure, the long breaks extending up through the center section of the bowl to the openings above were done last, thus assuring the elimination of contraction strains which might have set up if the opened cracks had been done first.

The breaks in the center section of the bowl were welded in a vertical position, and in order to facilitate the deposition of bronze a ½x1 in. piece of strap iron long enough to reach beyond each edge of the fracture was used to back up the weld. On the outside, or vee side, a dam was made up progressively as the weld metal was deposited. This was made up of ½ in. concrete reinforcing steel bars cut in sections long enough to extend beyond the edges of the vee. Each end of each bar was bent about 10 deg. so that the dam permitted sufficient reinforcement of the weld. As the welding progressed, a helper placed additional bars on top of each other, thus building up the dam and also permitting the welder to use a larger flame because he did not have to devote special attention to supporting the molten metal across the face of the vee. The strap and bars were left in place when the welding was completed, except in those sections where the surface of the weld had to be flush with the casting surface.

When all the welding was completed, the casting was heated up evenly with a wood fire and then permitted to cool slowly. A total of about 58 welding hours was required for this work, and about 285 lb. of high strength bronze-welding rod was used.

While supervising the welding of the bowl the service operator also supervised the cutting and removal of the more recently broken bowl which had locked itself in place. As there was a ¾-in. layer of zinc between the liner and the bowl, it was found difficult to get a good cut all the way through with the blowpipe alone. However, by stabbing several holes through the heavier sections with the oxygen lance the cutting of the steel and melting of the zinc were considerably facilitated. While cutting, the operators were careful to avoid, as far as possible, inhaling the zinc oxide fumes, and as an additional precaution against possible nausea from the fumes, they drank plenty of milk while this work was being done.

The total cost of reclaiming the old crusher bowl and removing the one that had been destroyed represented a saving of over $2000 as compared with the cost of a new crusher bowl.

## Removes Dragline from Creek with Own Power

ONE NIGHT when Leaf Bros. and Owens, contractors, were working in Reels Creek, Utica, N. Y., they left their Link-Belt dragline standing in the shallow creek overnight.

The next morning they discovered that the machine had become partially submerged as the creek had reached flood stage and washed away the foundation the dragline was parked on.

Getting the machine out of the creek

*Dragline in unexpected bath*

*Crawling out under own power*

might have been a difficult task, but they decided that as long as the machine had gone into the creek by itself, it would have to pull itself out. The operator dried out the watersoaked magneto, put in a new battery, started the engine and the dragline crawled up the bank to continue work.

The illustrations show the machine "all wet," and how it moved out of its night's bath under its own power.

## Water Sprays for Screens

AT THE NEW PLANT of the Concrete Materials Corp., Wallingford, Ia., additional screening capacity was found necessary, and this increase in capacity had to be quickly accomplished. So in place of installing another rota.y screen a Niagara vibrating screen (4 ft. by 10 ft.) was installed alongside of the rotary. There is nothing particularly novel about the installation except the method of spraying water over the top deck of the new screen. The method of doing this is clearly shown in the illustration where the eight scoop-like sprays throw the water counter current to the flow of descending gravel.

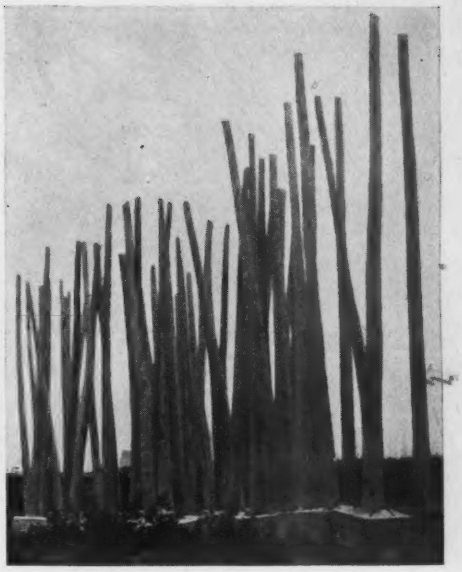
The sprays were made by the plant welder and consist of a 1-in. pipe nipple to which has been welded a fan shaped plate having shallow sides. The fan shaped plate is welded to the pipe at an angle so that the water, when it impinges against the plate, is spread over the screen as shown in the illustration. The fan shaped plate is made of 3/16-in. plate.

*Sprays throw water against flow of material on screen*

## Portable Trolley Poles for Quarry Service

ONE OF THE OBJECTIONS to the use of an overhead trolley system for electric haulage in a stone quarry is that when heavy blasts are made some provision must be made for protecting or removing the overhead wire. Shifting and extending the trackage also means that considerable work must be expended to dig holes for the poles supporting the wire or some elaborate means provided for bracing the poles from the railroad ties.

To overcome these objections and to simplify the entire haulage method, the Inland Lime and Stone Co., at its plant at Manistique, Mich., uses ordinary stripped wood poles that are roughly 20-ft. high with 8-in. butts. These are seated in concrete blocks (24-in. cubes). A strip of metal acts as a U-bolt and is embedded in the concrete to facilitate handling the poles.



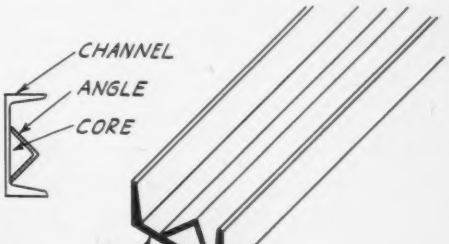
*Heavy bases hold poles upright*

The group of poles shown in the illustration is some of the spare supply and can be moved to the quarry and placed in service without the delays that would otherwise be necessary were the conventional type of pole used.

## An Inexpensive Way to Take Borings

**By John Alden**
**Evanston, Ill.**

IT IS OFTEN desirable when putting in foundations to obtain borings or cores in order to learn the nature of the substrata. Ordinarily borings are rather expensive and




a great deal of work is done on faith rather than go to the expense.

They can be obtained very cheaply, however, by means of a piece of ordinary channel iron and a section or two of angle iron as shown in the accompanying illustration. The channel iron is driven down into the ground as if it were a piece of sheet piling and then the angle iron is driven in close to one corner of the channel. Then they are both pulled up together and the core is obtained by simply turning up the angle. This method gives a perfect core complete from top to bottom and can be used anywhere that sheet piling can be driven.

# Editorial Comment

**Would Solve Problems of the Cement Industry!**

From two quite different sources or authorities there have recently come diagnoses of the ills of the portland cement industry, and recommended or suggested cures for those ills. One diagnosis and suggested cure, we suspect, has been received by the industry with some resentment; the other, if its sponsors are to be believed, has been received by cement manufacturers with welcome arms. One of the authorities which has undertaken to diagnose and prescribe is the Federal Trade Commission, an abstract of whose report was published in ROCK PRODUCTS, April 9; the other authority is *Engineering News-Record* (and *The Business Week,* issued by the same publisher), which published its diagnosis and recommended cure in its issues of March 17 and April 7.

The report of the Federal Trade Commission was the result of an investigation and study of the base price system of the cement industry in 1927-'29, inclusive, when the industry so to speak was "sitting on top of the world" (and there really was a base price system, since largely defunct). The *Engineering News-Record* articles on the other hand describe conditions that existed in 1931 and still exist, with familiar and distressing details.

The Federal Trade Commission really doesn't prescribe, consciously at least, any cure for the present ills of the cement industry, because these ills were not apparent when the report was written, it merely analyzes a competitive situation, which very probably carried the seeds of its own disintegration with it. For a diagnosis of the present ills of the cement industry and suggestions for their cure, one must read between the lines of the Federal Trade Commission report and make his own deductions or conclusions.

The diagnosis of *Engineering News-Record* is, by inference at least, that the little producer is at fault and the suggested cure is consolidations which would concentrate a large percentage of the production in the hands of six (Plan 1), five (Plan 2) or three (Plan 3—termed the ideal one) corporations with nationwide, or practically nationwide distribution facilities. Of course, as might be expected, these plans contain nothing startlingly new or original; and just what they would accomplish is very indefinitely stated; for example: "It is obvious that with this increased number of plants under their control the six large manufacturers will be better able to organize their production on a basis where they will have certain plants closed down entirely, while others will operate at high economy and make possible the lowest practicable selling price." At the same time however, it is stated: "Every possible effort has been made to avoid any suggestion that, if carried out, might lead to a monopoly or to the control of the industry by a comparatively small group. . . . The plans here proposed are based on the conviction that open competition can best be maintained if small, well financed, ably managed units are continued in individual operation in every important marketing area."

It would seem that these two statements are hardly consistent, to say the least. The only inference a really discerning reader could draw from them is that it would be fine to eliminate certain bad little operators but equally nice to preserve other good little operators. Such guarded and veiled methods of dealing with economic problems of competition may be deemed necessary or desirable by some people under our existing anti-trust laws, but for one we deplore them and believe far more can be accomplished both under existing laws, and toward revising existing laws, by a straightforward and open approach and discussion.

The *Engineering News-Record* suggestions or plans overlook what the Federal Trade Commission report indirectly emphasizes (and manufacturers in the industry know); which is that the cement industry essentially is a *local industry.* There is seldom any economic excuse for shipments of more than 200 or 300 miles from any mill (and often the justifiable distance is much less) except in the case of cheap water transportation. The raw materials for cement manufacture are quite widely distributed and a cement mill generally may be built within 200 or 300 miles of any important market. Where the raw materials do not exist in the more highly developed parts of the country they usually can be brought to a mill by cheap water transportation.

Any very distinctive operating or distribution advantages of a nationwide aggregation of mills in any strictly local industry seem at least open to question. We fail to see why a corporation with a nationwide organization is any more competent to sell cement in New York, Chicago, or any other of our big market centers, than is an organization with only one or two local mills strategically located to serve those markets. The only primary advantage we see in such nationwide aggregations of mills is the financial ability of a large organization to carry idle plants, or plants operating intermittently. The same advantage could be obtained by a different grouping.

**Local Grouping More Logical**

It would seem more logical from a selling or distribution angle to regroup the cement industry into local aggregations of mills which would own or control the major part of the productive capacity serving various local market territories. Obviously this is more complicated to work out because under the time-honored price basing system of the industry no definite market territorial limits have ever been recognized. But by regrouping the mills into strong local organizations it is quite possible and

even probable that a better definition of legitimate market territories for each group might result.

An advantage of the local grouping plan of operation is that it does not necessarily require consolidations or mergers. The plan may be accomplished by central sales agencies and prorating of production on an equitable basis. This has already been done locally in several instances in the concrete aggregate industry, and is being worked out on a grand scale by the coal industry. There are certain legal obstacles to be overcome, but these are not impossible in the case of a local industry as experience in the aggregate industry has proved.

In considering the price basing system of the cement industry it should be remembered that it developed under conditions when the industry was much less localized. It is the same system that develops naturally, apparently, in the case of any standardized staple commodity—flour for example. The price naturally gravitates to a certain standard in any market center, irrespective of the point of origin of the commodity. This should give certain mills preferential treatment in markets they are most strategically located to serve, but so long as the demand is steady and the producers stick to markets they can profitably serve, every one is happy.

However, what commentators on the price-basing system in the cement industry overlook (including apparently the Federal Trade Commission) is that the majority of cement markets do not represent a steady or consistent demand, as is the case with flour and other staples with which cement has been compared. Let us say that the legitimate shipping radius, or market territory, of a cement mill is within 300 miles of the mill; unless this happens to include a large growing city, or cities, the demand for cement is bound to fluctuate greatly from year to year, according to the inauguration or the completion of some big construction project such as a system of highways, a dam, bridge, etc. Obviously a mill that is limited to shipments within such a restricted territory must have a rather intermittent kind of operation so far as utilization of anything like its capacity is concerned.

**Average Cement Market Not Consistent**

Now, maybe that is what a cement-mill operation should be. We have always assumed that it is very uneconomical and bad business to operate a mill thus intermittently; that one must have as broad a base for operation as possible. Hence there has grown up a tremendous overlapping of natural market territories, an enormous duplication of sales effort, a large amount of cross-hauling, a great amount of price-cutting, the net result of all being considerable profit to the railways, a notable saving to cement consumers, a large loss to cement manufacturers.

It would seem to us, and the Federal Trade Commission report apparently substantiates the thought, that some of the troubles of the cement industry are due as much to the aspirations of some of the big companies to achieve as near national distribution as they can, regardless of consequences, as to the failure of the smaller companies to stay in line. It also seems much easier of accomplishment for local groups in well organized local market territories to control production and price in those local territories than for half a dozen companies to control production and prices on a national scale. There will always be enough independents to create sore spots in the industry, but these sore spots are not so likely to contaminate the whole if they are in isolated sales territories that the others can afford to let alone. With five or six national organizations competing for *all* the business, the remaining little ones may be driven still farther afield for their orders, and thus become just so much worse nuisances to the big ones. While they may be driven into bankruptcy now and then, after all the plants are going to remain, to be operated by new owners, or to be absorbed by one of the larger organizations. In the latter case the big companies will be handicapped by excessive capital charges and it will be hard to prevent new plants coming into production the moment the price of cement makes them look attractive.

Whether existing cement mills are grouped in nationwide selling organizations or in local selling organizations will naturally have much bearing on the system of promotion and distribution of portland cement. Five or six nationwide corporations means of course five or six national *brands* to be advertised and promoted, in competition with each other. On the other hand local grouping of mills to serve local territories would go a long way toward a really standardized cement and thus eliminate the value and significance of brand names. Under such a scheme of local aggregations of mills either through consolidations or central selling organizations as we have suggested, money that would otherwise be spent for advertising and promotion of individual brands probably could be spent to equal or better advantage in promoting concrete construction locally in competition with other types of construction, and in actually instigating and promoting new construction projects. This could be done either by the local groups as such, or better probably by the Portland Cement Association, as in the past.

We hold no brief for either plan of grouping or advertising and promotion. We don't know which would prove the best. But if a reorganization of the industry is being considered both plans should be carefully weighed. However, neither plan is really essential to solve the problem. The solution is far simpler. It is *just don't make sales below cost* under any conditions. If manufacturers would do this market territories and cross-hauling would take care of themselves. It is obvious that to go on as at present spells bankruptcy to many organizations, and bankruptcies are not helpful to the industry as a whole.

We suggest cement manufacturers as well as other rock products producers read and study the article elsewhere in this issue on "The Volume Delusion," for it brings out very clearly and accurately some facts in regard to the effect of volume on costs that should help them get a price for their product commensurate with its cost.

# Financial News and Comment

## RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

| Stock | Date | Bid | Asked | Dividend |
|---|---|---|---|---|
| Allentown P. C. 1st 6's[27] | 4-20-32 | 90 | 95 | |
| Alpha P. C. com.[2] | 4-16-32 | 6 | 6½ | 25c qu. Apr. 25 |
| Alpha P. C. pfd.[2] | 4-16-32 | ........ | 90 | 1.75 qu. Mar. 15 |
| Amalgamated Phosphate Co. 6's, 1936[19] | 4-15-32 | 80 | ........ | |
| American Aggregates com.[19] | 4-15-32 | 2 | 5 | |
| American Aggregates pfd.[19] | 4-15-32 | 10 | 20 | 1.75 qu. Jan. 1 |
| Amer. Aggr. 6's, w.w.[19] | 4-15-32 | 25 | 35 | |
| Amer. Aggr. 6's, ex.w.[19] | 4-15-32 | 23 | 33 | |
| Amer. L. & S. 1st 7's[27] | 4-20-32 | 70 | 80 | |
| American Silica Corp. 6½'s[30] | 4-20-32 | No market | | |
| Arundel Corp. new com. | 4- 8-32 | 23 actual sale | | 75c qu. Apr. 1 |
| Bessemer L. & C. Class A | 4-19-32 | ........ | 5 | |
| Bessemer L. & C. 1st 6½'s[4] | 4-15-32 | 20 | 30 | |
| Bloomington Limestone 6's[27] | 4-20-32 | ........ | 25 | |
| Boston S. & G. new com.[37] | 4-15-32 | 4 | 7 | 15c qu. Apr. 1 |
| Boston S. & G. new 7% pfd.[37] | 4-15-32 | 25 | 35 | 87½c qu. Apr. 1 |
| California Art Tile, A | 4-15-32 | 1½ | 5 | |
| California Art Tile, B[40] | 4-14-32 | ........ | 3 | |
| Calaveras Cement com. | 4-15-32 | ½ | 2 | |
| Calaveras Cement 7% pfd. | 4-15-32 | ........ | 56 | 1.75 qu. Apr. 15 |
| Canada Cement com. | 4-19-32 | 4 | 5 | |
| Canada Cement pfd. | 4-19-32 | ........ | 57 | 1.62½ qu. Mar. 31 |
| Canada Cement 5½'s[42] | 4-15-32 | 84 | 88 | |
| Canada Crushed Stone bonds[42] | 4-15-32 | 60 | 65 | |
| Canada Crushed Stone com.[42] | 4-15-32 | 3 | ........ | |
| Certainteed Products com. | 4-19-32 | 1½ | 1¾ | |
| Certainteed Products pfd. | 4-19-32 | 8 | 10 | 1.75 qu. Jan. 1 |
| Cleveland Quarries | 4-19-32 | ........ | 54 | 25c qu. Mar. 1 |
| Consol. Cement 1st 6½'s, A[44] | 4-20-32 | 3 | 7 | |
| Consol. Cement notes, 1941[27] | 4-20-32 | No market | | |
| Consol. Cement pfd.[27] | 4-20-32 | ........ | 50 | |
| Consolidated Oka Sand and Gravel (Canada) 6½'s[12] | 4-15-32 | 80 | 85 | |
| Consolidated Oka Sand and Gravel (Canada) pfd.[41] | 3-29-32 | 38 | ........ | 1.75 qu. Oct.10,'31 |
| Consol. Rock Prod. com.[9] | 4-14-32 | 25c | 35c | |
| Consol. Rock Prod. pfd.[9] | 4-14-32 | 2 | 2½ | |
| Consol. Rock Prod. units[35] | 4-14-32 | 1½ | 2½ | |
| Consol. S. & G. pfd. (Can.) | 4-19-32 | ........ | 50 | 1.75 qu. Feb.15 |
| Construction Mat. com. | 4-19-32 | ⅞ | 2½ | |
| Construction Mat. pfd. | 4-19-32 | 2¼ | 5 | |
| Consumers Rock and Gravel, 1st Mtg. 6's. 1948[35] | 4-14-32 | 40 | 43 | |
| Coosa P. C. 1st 6's[23] | 4-15-32 | ........ | 30 | |
| Coplay Cem. Mfg. 1st 6's[33] | 4-15-32 | 50 | 70 | |
| Coplay Cem. Mfg. com.[33] | 4-15-32 | 5 | 7½ | |
| Coplay Cem. Mfg. pfd.[33] | 4-15-32 | 25 | 40 | |
| Dewey P. C. com.[47] | 4-20-32 | 85 | 95 | |
| Dolese and Shepard | 4-19-32 | 14 | 16 | $1 qu. Jan. 1 |
| Dufferin Pav. & Cr. Stone pfd. | 4-19-32 | ........ | 39 | 1.75 qu. Apr. 1 |
| Dufferin Pav. & Cr. Stone com. | 4-19-32 | ........ | 5 | |
| Federal P. C. 6½'s, 1941[19] | 4-15-32 | 62 | ........ | |
| Giant P. C. com.[2] | 4-16-32 | 2 | 4 | |
| Giant P. C. pfd.[2] | 4-16-32 | 7 | 10 | 1.75 s.-a. Dec. 15 |
| Gyp. Lime & Alabastine, Ltd. | 4-19-32 | 3 | 3⅛ | 10c qu. Oct.5,'31 |
| Gyp. Lime & Alabastine 5½'s[42] | 4-15-32 | 58 | 60 | |
| Hermitage Cement com.[11] | 4-16-32 | 5 | 10 | |
| Hermitage Cement pfd.[11] | 4-16-32 | 25 | 35 | |
| Ideal Cement 5's, 1943[29] | 4-16-32 | 90 | 95 | |
| Ideal Cement com. | 4-19-32 | 18 | 20 | 50c qu. Apr. 1 |
| Indiana Limestone units[27] | 4-20-32 | No market | | |
| Indiana Limestone 6's | 4-16-32 | 10 actual sale | | |
| International Cem. com. | 4-19-32 | 8¼ | 10 | 50c qu. Mar. 31 |
| International Cem. bonds, 5's | 4-19-32 | 53 | 53¼ | Semi-ann. int. |
| Iron City Sand & Gravel 6's[36] | 3-18-32 | ........ | 70 | |
| Kelley Is. L. & T. new stock | 4-19-32 | ........ | 12 | 25c qu. Apr. 1 |
| Ky. Cons. Stone com. | 4-18-32 | ........ | 2 | |
| Ky. Cons. Stone pfd. | 4-18-32 | ........ | 50 | |
| Ky. Cons. St. 1st Mtg. 6½'s[45] | 4-14-32 | 30 | 40 | |
| Ky. Cons. St. V. T. C.[45] | 4-14-32 | ½ | 1 | |
| Ky. Rock Asphalt com. | 4-18-32 | 1¾ | 2½ | |
| Ky. Rock Asphalt pfd. | 4-18-32 | 20 | 25 | 1.75 qu. Dec. 1,'31 |
| Ky. Rock Asphalt 6½'s | 4-18-32 | 81½ | 85 | |
| Lawrence P. C.[2] | 4-16-32 | 9 | 13 | |
| Lawrence P. C. 5½'s, 1942[2] | 4-16-32 | 30 | 34 | |
| Lehigh P. C. com. | 4-19-32 | 4 | 5 | |
| Lehigh P. C. pfd. | 4-19-32 | 58½ | 62 | 1.75 qu. Apr. 1 |
| Louisville Cement[7] | 4-15-32 | 125 | 150 | |
| Lyman-Richey 1st 6's, 1932[13] | 4-15-32 | 95 | ........ | |
| Lyman-Richey 1st 6's, 1935[13] | 4-15-32 | 90 | ........ | |
| Marblehead Lime 6's[14] | 4-15-32 | No market | | |
| Marbelite Corp. com.[35] (cement products) | 4-14-32 | 5c | 50c | |
| Marbelite Corp. pfd.[35] | 4-14-32 | 50c | ........ | |
| Marquette Cem. Mfg. 1st 5's, 1936[46] | 4-21-32 | 80 | ........ | |
| Marquette Cem. Mfg. 1st 6's, 1936[46] | 4-21-32 | 87 | ........ | |
| Material Service Corp. | 4-19-32 | 11 | 12 | |
| McCrady-Rodgers 7% pfd.[22] | 4-14-32 | 35 | 42 | 87½c qu. Dec. 30, 1931 |
| McCrady-Rodgers com.[22] | 4-14-32 | 5 | 10 | 75c qu. Jan. 26 |
| Medusa P. C. pfd.[47] | 4-20-32 | 50 | 60 | 1.50 qu. Apr. 1 |
| Medusa P. C. com. | 4-19-32 | 6⅝ | 10 | |
| Monarch Cement com.[47] | 4-20-32 | 65 | 70 | |
| Michigan L. & C. com.[6] | 4- 2-32 | 45 | ........ | |
| Missouri P. C. | 4-19-32 | 6 | 8 | 25c qu. Jan. 30 |
| Monolith Portland Midwest com.[9] | 4-14-32 | ¾ | 1 | |
| Monolith P. C. com. | 4-15-32 | ........ | 1½ | 40c s.-a. Jan. 1 |
| Monolith P. C. pfd. | 4-15-32 | ........ | 2½ | 40c s.-a. Jan. 1 |
| Monolith P. C. units[9] | 4-14-32 | 8½ | 10 | |
| Monolith P. C. 1st Mtg. 6's[9] | 4-14-32 | 55 | 62 | |
| National Cem. (Can.) 1st 7's[27] | 4-20-32 | 85 | 95 | |
| National Gypsum A com.[27] | 4-20-32 | 1 | 2 | |
| National Gypsum pfd.[27] | 4-20-32 | 23 | 27 | 1.75 qu. Apr. 1 |
| National Gypsum 6's[3] | 4-20-32 | 50 | ........ | |
| Newaygo P. C. 1st 6½'s[27] | 4-20-32 | 78 | ........ | |
| New England Lime 6's, 1935[14] | 4-15-32 | 10 | 20 | |
| N. Y. Trap Rock 1st 6's | 4-19-32 | 60 actual sale | | |
| N. Y. Trap Rock 7% pfd.[30] | 3- 4-32 | 52 | ........ | 1.75 qu. Apr. 1 |
| North Amer. Cem. 1st 6½'s | 4-15-32 | 18 | 19 | |
| North Amer. Cem. com.[27] | 4-20-32 | ½ | 1 | |
| North Amer. Cem. 7% pfd.[27] | 4-20-32 | 1 | 4 | |
| North Shore Mat. 1st 5's[15] | 4-20-32 | No market | | |
| Northwestern States P. C.[47] | 4-20-32 | 23 | 28 | |
| Ohio River S. & G. com. | 4-18-32 | ........ | 8 | |
| Ohio River S. & G. 7% pfd. | 4-18-32 | ........ | 98 | |
| Ohio River S. & G. 6's[16] | 4-16-32 | 40 | 60 | |
| Oregon P. C. com.[9] | 4-14-32 | 8 | 12 | |
| Oregon P. C. pfd.[9] | 4-14-32 | 80 | 85 | |
| Pacific Coast Aggr. com.[40] | 4-14-32 | ........ | ½ | |
| Pacific Coast Aggr. pfd.[40] | 4-14-32 | ........ | 1 | |
| Pacific Coast Aggr. 6½'s, 1944[5] | 4-14-32 | 20 | 23 | |
| Pacific Coast Aggr. 7's, 1939[5] | 4-14-32 | 4 | 7 | |
| Pacific Coast Cement 6's[5] | 4-14-32 | 75 | ........ | |
| Pacific P. C. com. | 4-15-32 | 3 | 6 | |
| Pacific P. C. pfd. | 4-15-32 | ........ | 48 | 1.62½ qu. Apr. 5 |
| Pacific P. C. 6's[5] | 4-14-32 | 88 | ........ | |
| Peerless Cement com.[1] | 4-15-32 | 10c | 75c | |
| Peerless Cement pfd.[1] | 4-15-32 | 4 | 10 | |
| Penn.-Dixie Cement com. | 4-18-32 | ⅝ | ¾ | |
| Penn.-Dixie Cement pfd. | 4-18-32 | 5 | 8 | |
| Penn.-Dixie Cement 6's | 4-18-32 | 39 actual sale | | |
| Penn. Glass Sand Corp. pfd.[19] | 4-15-32 | 55 | 65 | 1.75 qu. Apr. 1 |
| Penn. Glass Sand Corp. 6's[19] | 4-15-32 | 81 | 85 | |
| Petoskey P. C. | 4-19-32 | 2 | 2½ | |
| Port Stockton Cem. com.[9] | 4-14-32 | No market | | |
| Riverside Cement com.[9] | 4-14-32 | ........ | 12 | |
| Riverside Cement pfd.[9] | 4-14-32 | 55 | 60 | 1.50 qu. May 1 |
| Riverside Cement, A | 4-15-32 | ........ | 8 | |
| Riverside Cement, B[9] | 4-14-32 | 70c | 1 | |
| Roquemore Gravel 6½'s[17] | 4-16-32 | 90 | 98 | |
| Sandusky Cement 6½'s, 1932-37[19] | 4-15-32 | 87 | 93 | |
| Santa Cruz P. C. com. | 4-15-32 | ........ | 75 | $1 qu. Apr. 1 |
| Schumacher Wallboard com. | 3-30-32 | 1½ | ........ | |
| Schumacher Wallboard pfd. | 4-14-32 | ........ | 20 | 50c qu. Feb. 15 |
| Signal Mt. P. C. pfd.[47] | 4-15-32 | 4 | ........ | |
| Southwestern P. C. units[35] | 4-14-32 | 150 | ........ | |
| Standard Paving & Mat. (Canada) com. | 4-19-32 | 1½ | 2 | |
| Standard Paving & Mat. pfd. | 4-19-32 | ........ | 35 | 1.75 qu. Feb. 5 |
| Superior P. C., A | 4-15-32 | ........ | 28 | 27½c mo. May 1 |
| Superior P. C., B | 4-15-32 | 5 | 5½ | 12½c Mar. 21 |
| Trinity P. C., units[47] | 4-20-32 | 25 | 30 | |
| Trinity P. C. com.[47] | 4-20-32 | 5 | 10 | |
| Trinity P. C. pfd.[47] | 4-20-32 | 20 | 25 | |
| U. S. Gypsum com. | 4-19-32 | 15¾ | 16½ | 40c qu. Mar. 31 |
| U. S. Gypsum pfd. | 4-19-32 | 99 | 103¼ | 1.75 qu. Mar. 31 |
| Wabash P. C.[21] | 4-16-32 | 6¼ | 8¼ | |
| Warner Co. com.[16] | 4-16-32 | 3½ | 4 | 25c qu. Oct.15,'31 |
| Warner Co. 1st 7% pfd.[16] | 4-16-32 | ........ | 50 | 1.75 qu. Apr. 1 |
| Warner Co. 6's, 1944, with war. | 4-16-32 | 60 actual sale | | |
| Whitehall Cem. Mfg. com.[19] | 4-15-32 | ........ | 55 | |
| Whitehall Cem. Mfg. pfd.[19] | 4-15-32 | 35 | 45 | |
| Wisconsin L. & C. 1st 6's[15] | 4-20-32 | No market | | |
| Wolverine P. C. com. | 4-19-32 | ........ | 3¼ | 15c qu. Nov.15,'31 |
| Yosemite P. C. A. com.[9] | 4-14-32 | 1 | 1½ | |

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bank & Trust Co., Chicago. [16]J. S. Wilson, Jr., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Toronto. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]First Union Trust & Savings Bank, Chicago. [47]Anderson Plotz and Co., Chicago, Ill.

## International Cement Corp.

THE International Cement Corp., New York City, reports for the year ended December 31, 1931: Consolidated net income, after all charges including depreciation, depletion, interest on debentures and federal income taxes, amounted to $1,358,212.84, as compared with $4,539,509.51 for the year 1930. This is equivalent to $2.13 per share on the 636,450 shares of common stock outstanding at the close of the year, as compared with $7.14 per share on the 635,798 shares of common stock outstanding at the close of 1930.

Earnings for the year 1931 are accounted for in the following summary of income and disposition:

| | |
|---|---|
| Income: | |
| Net income from operations | $1,358,212.84 |
| From depreciation, depletion and insurance reserves for which there were no cash expenditures | 2,955,593.10 |
| From decrease in net current assets | 1,435,175.65 |
| | $5,748,981.59 |
| Disposition: | |
| Dividends paid | $2,357,309.75 |
| Invested in capital assets represented by Brazilian properties and plant, and improvements in other plants | 2,137,023.86 |
| Investment in securities | 387,993.48 |
| Surplus adjustments including $861,886.71 reduction of net current assets due to decline in foreign exchange | 866,654.50 |
| | $5,748,981.59 |

Capital expenditures of operating companies during the year totaled $2,137,023.86, the major items of which were as follows:

Work on construction of a 1,000,000-bbl. plant near the city of Rio de Janeiro, in Brazil, which should be completed by the latter part of 1932.

Installation of two 400-ft. kilns with necessary coolers and grinding equipment at the Houston (Tex.) plant. This work was practically completed during the year.

Installation of necessary equipment for the production of "Incor" cement at the Dallas (Tex.) plant.

Installation of bulk loading facilities at five domestic plants.

Installation of power and packing equipment on the Cuban subsidiary's bulk loading motorship for delivery of packed cement to foreign ports.

Installation of an electric shovel and other quarry equipment at the Argentine plant.

The trying period of economic depression and financial adversity through which we are passing, states President Struckmann's report, has resulted in a tremendous reduction of building construction and public works and a corresponding reduction in cement consumption. According to Government statistics, cement production in the United States equaled only 46½% of the country's estimated capacity, compared with a production of 61½% during the previous year. The reduction in consumption resulted in intense competition and a constant shrinkage of selling prices, which reached the lowest levels since the world war.

The company's policy of making expenditures for improvements during previous years and of keeping the plants in the highest state of efficiency has been fully justified by the excellent operating results obtained.

### COMPARATIVE CONSOLIDATED INCOME ACCOUNT OF THE INTERNATIONAL CEMENT CORP. AND SUBSIDIARY COMPANIES

(For the years ended December 31, 1931, and December 31, 1930)

| | 1931 | 1930 | Decrease |
|---|---|---|---|
| Sales, less discounts, allowances, etc. | $20,087,148.29 | $27,037,855.08 | $ 6,950,706.79 |
| Cost of sales: | | | |
| Manufacturing costs and shipping expenses | $11,932,264.27 | $14,573,987.56 | $ 2,641,723.29 |
| Provision for depreciation and depletion | 2,906,863.26 | 3,034,578.49 | 127,715.23 |
| Total cost of sales | $14,839,127.53 | $17,608,566.05 | $ 2,769,438.52 |
| Manufacturing profit | $ 5,248,020.76 | $ 9,429,289.03 | $ 4,181,268.27 |
| Selling, administration, and general expenses | 2,691,834.01 | 3,299,511.18 | 607,677.17 |
| Net profit from operations | $ 2,556,186.75 | $ 6,129,777.85 | $ 3,573,591.10 |
| Miscellaneous income | 298,049.26 | 346,289.48 | 48,240.22 |
| Total income | $ 2,854,236.01 | $ 6,476,067.33 | $ 3,621,831.32 |
| Interest on indebtedness, including amortization of debenture discount and expenses | $ 990,945.63 | $ 990,413.93 | *$ 531.70 |
| Provision for income taxes and miscellaneous charges | 505,077.54 | 946,143.89† | 441,066.35 |
| | $ 1,496,023.17 | $ 1,936,557.82 | $ 440,534.65 |
| Net income for year carried to surplus account | $ 1,358,212.84 | $ 4,539,509.51 | $ 3,181,296.67 |

### CONSOLIDATED SURPLUS ACCOUNT

| | | |
|---|---|---|
| Balance at December 31, 1930 | | $14,852,557.64 |
| Add: | | |
| Net income for the year ending December 31, 1931 | | 1,358,212.84 |
| | | $16,210,770.48 |
| Deduct: | | |
| Amount transferred to statutory surplus of subsidiary company in Argentina | $ 23,791.48 | |
| Provision for decline in exchange on net current assets in South America and other exchange adjustments | 861,886.71 | |
| Equipment dismantled, less accrued depreciation | 181,644.08 | |
| Income taxes and other charges affecting prior years | 86,400.11 | 1,153,722.38 |
| | | $15,057,048.10 |
| Deduct—Dividends paid: | | |
| International Cement Corp.—Common stock | $ 2,357,015.75 | |
| Subsidiary companies—on capital stock not owned by International Cement Corp. | 294.00 | 2,357,309.75 |
| Surplus—Carried to balance sheet December 31, 1931 | | $12,699,738.35 |

*Increase.

†Includes deductions incident to computing net profits of South American subsidiary companies at average rates of exchange prevailing during the year 1930. In 1931 the deductions have been made from the items to which they are applicable.

### COMPARATIVE CONSOLIDATED BALANCE SHEET OF THE INTERNATIONAL CEMENT CORP. AND SUBSIDIARY COMPANIES

(Years ended December 31, 1931-1930)

ASSETS

| | 1931 | 1930 | Decrease |
|---|---|---|---|
| Current and working assets: | | | |
| Cash | $ 2,445,858.70 | $ 3,818,615.63 | $ 1,372,756.93 |
| Marketable securities | ............... | 13,179,39 | 13,179.39 |
| Accounts and notes receivable: | | | |
| Customers accounts | $ 2,220,297.91 | $ 2,677,901.91 | $ 457,604.00 |
| Miscellaneous accounts | 171,258.75 | 114,148.21 | *57,110.54 |
| Notes receivable | 251,438.49 | 98,081.85 | *153,356.64 |
| | $ 2,642,995.15 | $ 2,890,131.97 | $ 247,136.82 |
| Reserve for doubtful items | 118,000.00 | 125,000.00 | 7,000.00 |
| | $ 2,524,995.15 | $ 2,765,131.97 | $ 240,136.82 |
| Inventories: | | | |
| Finished cement and process stocks at cost which is below market | $ 1,771,329.79 | $ 2,336,767.81 | $ 565,438.02 |
| Packages, fuel, spare machinery parts and general supplies, at cost | 2,969,344.52 | 3,537,817.31 | 568,472.79 |
| | $ 4,740,674.31 | $ 5,874,585.12 | $ 1,133,910.81 |
| | $ 9,711,528.16 | $12,471,512.11 | $ 2,759,983.95 |
| Less: Reserve for loss on exchange on net current assets in South America | † | 778,612.77 | 778,612.77 |
| | $ 9,711,528.16 | $11,692,899.34 | $ 1,981,371.18 |
| Miscellaneous investments, at cost: | | | |
| Republic of Cuba 5½% gold notes due 1933-1935 and sundry other securities | $ 292,710.87 | $ 38,743.14 | *$ 253,967.73 |
| 9,400 shares of common stock of International Cement Corp. | 350,100.75 | 216,075.00‡ | *134,025.75 |
| | $ 642,811.62 | $ 254,818.14 | *$ 387,993.48 |
| Capital assets: | | | |
| Plant sites, mineral lands, rights, buildings, machinery, and equipment | $62,282,313.90 | $60,761,948.99 | *$ 1,520,364.91 |
| Reserve for depreciation and depletion and other property reserves | 19,845,292.27 | 17,348,216.00 | *2,497,076.27 |
| | $42,437,021.63 | $43,413,732.99 | $ 976,711.36 |
| Deferred charges: | | | |
| Debenture discount and expenses | $ 1,234,490.40 | $ 1,310,072.40 | $ 75,582.00 |
| Prepaid expenses and other deferred items | 225,424.06 | 224,704.64 | *719.42 |
| | $ 1,459,914.46 | $ 1,534,777.04 | $ 74,862.58 |
| | $54,251,275.87 | $56,896,227.51 | $ 2,644,951.64 |

*Increase.

†Net current assets in South America at December 31, 1931, exchange rates.

‡4,300 shares at market.

LIABILITIES

| | 1931 | 1930 | Decrease |
|---|---|---|---|
| Current liabilities: | | | |
| Accounts payable | $ 674,799.55 | $ 1,096,316.68 | $ 421,517.13 |
| Accrued interest and expenses | 337,248.62 | 358,174.69 | 20,926.07 |
| Provision for taxes | 356,000.00 | 459,752.33 | 103,752.33 |
| | $ 1,368,048.17 | $ 1,914,243.70 | $ 546,195.53 |
| Insurance reserves | $ 88,233.71 | $ 39,503.87 | *$ 48,729.84 |
| Employes' subscriptions to capital stock | $ 26,932.65 | $ 76,367.10 | $ 49,434.45 |
| Funded debt: | | | |
| Twenty year 5% convertible gold debentures due May 1, 1948 | $18,000,000.00 | $18,000,000.00 | ........ |
| Retired through conversion into capital stock | 4,500.00 | 4,500.00 | ........ |
| | $17,995,500.00 | $17,995,500.00 | ........ |
| Capital stock of subsidiary companies not owned | $ 8,250.00 | $ 11,630.00 | $ 3,380.00 |
| Capital and surplus: | | | |
| Common stock: | | | |
| Authorized 1,000,000 shares no par value‡ Issued—636,450 shares | $21,885,342.55 | $21,850,986.24† | *$ 34,356.31 |
| Surplus of subsidiary company in Argentina set aside in accordance with Argentine law | 179,230.44 | 155,438.96 | *23,791.48 |
| Earned surplus | 12,699,738.35 | 14,852,557.64 | 2,152,819.29 |
| | $34,764,311.34 | $36,858,982.84 | $ 2,094,671.50 |
| | $54,251,275.87 | $56,896,227.51 | $ 2,644,951.64 |

*Increase.
†635,798 shares.
‡202,300 shares reserved for conversion of debentures and for officers and employes under subscription plan.

This, together with the most rigid economies and reduction in salaries, served to greatly reduce operating expenses, thus partly offsetting the decrease in income. All plants were maintained in their usual excellent condition and, in accordance with the company's policy, full depreciation and depletion reserves amounting to $2,906,863.26 were set up.

Unsettled world conditions have brought about a demoralization of foreign exchange. Recognizing the severe decline in South American exchange, it was considered desirable in presenting this report to reflect these changed conditions, and instead of including the total exchange loss in miscellaneous charges in the profit and loss account, it has been deducted from the items to which it is applicable—that is, sales, costs, et cetera. Current and working accounts shown on the balance sheet were likewise individually reduced at December 31, 1931, instead of deducting a reserve for the total amount as at December 31, 1930.

The demand for the high-early-strength cement, which the operating companies have been marketing under the trade name "Incor" continued to increase, and it was deemed advisable to equip the Dallas (Tex.) plant with facilities for manufacturing this product, thus providing facilities for the manufacture of "Incor" cement in five states, viz., Pennsylvania, Indiana, Kansas, Texas and Alabama.

Licenses were granted for the manufacture of "Incor" cement for Denmark, Norway, Sweden and Finland, and negotiations are now practically completed for licensing one of the leading cement companies in Australia.

For the purpose of conserving the corporation's cash resources a reduction in dividend from $1.00 to 75c. per share was made for the last quarter of the year and a further reduction to 50c. per share was made for the first quarter of 1932.

Further reductions in overhead as well as in salaries and in wages were put into effect on January 1, 1932.

At the close of the year 1931, the corporation's capitalization was as follows:

Twenty-year 5% convertible gold debentures—$17,995,500.

Common stock (no par value)—636,450 shares.

The tabulation given below shows data usually submitted in the annual report, illustrating the growth of the corporation to the end of 1931.

## Recent Dividends Announced

Associated Portland Cement Mfg., Ltd., American dep. rec. ord. registered..............(w)8% Apr. 20
Eastern Magnesia Talc Co., Inc., com. (qu.)....................$0.50, Mar. 31
Riverside Cement $6 pfd. (qu.) ........................................ 1.50, May 1

(w) Less deduction for expenses of depositary.

## Kentucky Rock Asphalt

THE Kentucky Rock Asphalt Co., Louisville, Ky., reports income for the year 1931 and consolidated balance sheet as of December 31, 1931 (with comparison of December 31, 1930) as follows:

INCOME ACCOUNT, YEARS ENDED DECEMBER 31

| | 1931 | 1930 |
|---|---|---|
| Net income | (d)$45,481 | $307,073 |
| Preferred dividends | 91,322 | 91,322 |
| Common dividends | ........ | 152,098 |
| Surplus | *(d)$136,803 | $63,653 |

*Before $176,000 net surplus debit adjustments.

BALANCE SHEET AS OF DECEMBER 31

| Assets: | 1931 | 1930 |
|---|---|---|
| *Plants and mining rights | $4,803,057 | $4,876,025 |
| Current assets: | | |
| Cash in banks | 264,333 | 158,425 |
| Accounts and notes receivable | 256,667 | 357,928 |
| Inventories | 110,461 | 276,742 |
| Deferred expense | 349,478 | 379,903 |
| Sinking fund | 3,033 | 3,033 |
| Organization expense | 5,138 | 5,138 |
| Deposit in closed bank | ........ | 200,000 |
| Total | $5,792,166 | $6,257,194 |
| Liabilities: | | |
| Preferred stock | $1,304,600 | $1,304,600 |
| †Common stock and surplus | 3,156,674 | 3,156,673 |
| Bonded debt | 800,500 | 941,500 |
| ‡6% notes due June 1, 1931 | 200,000 | 200,000 |
| Current liabilities: | | |
| Accounts payable | 19,806 | 50,865 |
| Notes receivable discounted | 46,546 | ........ |
| Accrued interest | 20,576 | 5,100 |
| Reserve for federal taxes | ........ | 43,982 |
| Reserve for insurance | 25,792 | 23,392 |
| Undivided profits | 217,672 | 531,082 |
| Total | $5,792,166 | $6,257,194 |
| Current assets | $631,461 | $793,095 |
| Current liabilities | 86,926 | 99,947 |
| Working capital | $544,535 | $693,148 |

*Less depreciation: 1931, $668,364; 1930, $581,329. †Represented by 126,820 no par shares. ‡In litigation.

## Missouri Portland Cement Passes Dividend

AT the regular meeting of the board of directors of the Missouri Portland Cement Co., St. Louis, Mo., April 19, after full consideration it was decided that the best interests of the company would be conserved by deferring the dividend, this being the first time in over 30 years that a quarterly dividend has not been declared.

## Phosphate Exports from Florida

PHOSPHATE exports from Tampa, Fla., during March totaled 47,563 tons, or 10,000 tons more than the average for the five preceding months, and the largest since September, 1931, when they exceeded 61,000 tons.—*New York Journal of Commerce.*

| Year | Productive capacity, bbl. | Capitalization: Funded debt and notes | Capitalization: Preferred 7% cumulative | Capitalization: Common no par shares | Sales | Total income | Interest, federal taxes, etc. | Net income | Balance for common | Earnings per share common |
|---|---|---|---|---|---|---|---|---|---|---|
| 1919 | 2,800,000 | $3,649,524 | ........ | 238,686 | $4,492,624 | $743,039 | $425,435 | $317,604 | $317,604 | $1.33 |
| 1920 | 3,200,000 | 2,636,938 | ........ | 268,139 | 8,461,896 | 2,564,009 | 784,450 | 1,779,559 | 1,779,559 | 6.62 |
| 1921 | 4,450,000 | 1,840,801 | $1,558,000 | 323,978 | 9,172,311 | 2,271,127 | 741,226 | 1,529,901 | 1,475,374 | 4.55 |
| 1922 | 4,450,000 | 1,627,758 | 1,409,700 | 324,047 | 9,407,725 | 1,862,080 | 437,033 | 1,425,047 | 1,318,031 | 4.06 |
| 1923 | 5,400,000 | 345,900 | 1,468,700 | 364,167 | 11,289,117 | 2,972,430 | 549,853 | 2,422,577 | 2,319,225 | 6.37 |
| 1924 | 7,000,000 | ........ | 3,411,800 | 400,000 | 13,683,503 | 3,771,397 | 723,890 | 3,047,507 | 2,853,917 | 7.14 |
| 1925 | 12,000,000 | ........ | 9,971,700 | 500,000 | 17,713,900 | 4,638,821 | 662,436 | 3,976,385 | 3,518,462 | 7.03 |
| 1926 | 14,700,000 | ........ | 9,694,400 | 562,500 | 21,623,582 | 5,236,220 | 881,020 | 4,355,199 | 3,669,441 | 6.52 |
| 1927 | 16,200,000 | ........ | 9,549,800 | 562,500 | 23,671,138 | 5,420,859 | 866,687 | 4,554,172 | 3,882,983 | 6.90 |
| 1928 | 20,000,000 | 18,000,000 | ........ | 618,826 | 27,595,096 | 6,576,494 | 1,427,105 | 5,149,388 | 4,893,012 | 7.90 |
| 1929 | 22,000,000 | 17,995,500 | ........ | 627,865 | 28,370,031 | 6,620,925 | 1,670,492 | 4,950,433 | 4,950,433 | 7.88 |
| 1930 | 24,000,000 | 17,995,500 | ........ | 635,798 | 27,037,855 | 6,476,067 | 1,936,557 | 4,539,509 | 4,539,509 | 7.14 |
| 1931 | 24,000,000 | 17,995,500 | ........ | 636,450 | 20,087,148 | 2,854,236 | 1,496,023 | 1,358,212 | 1,358,212 | 2.13 |

## Improving Dealer Accounting Practices

HOW MANUFACTURERS and wholesalers are helping their retailers to put their accounting methods on a sound and accurate basis is the subject of a report that has just been published by the Policyholders Service Bureau of the Metropolitan Life Insurance Co., New York, N. Y., entitled "Improving Dealer Accounting Practices."

"Many manufacturers and wholesalers are coming to realize that their own economic welfare depends to a considerable extent on an economically healthy distributing organization," the report states, and quotes Alfred P. Sloan, Jr., president of General Motors, as saying that "the strength and permanency of any producer must be measured in terms of the strength of his retailing organization."

Assistance to retailers on the part of manufacturers or wholesalers who supply them with merchandise was limited originally largely to problems of selling. Such aid has been considerably broadened in recent years, according to the report. One of the more important of the newer activities is assistance in accounting — a service "based on the principle that intelligent management in any field of endeavor requires adequate, prompt information on current and past operations." This theory has been followed by a few manufacturers in the rock products industry and it is interesting to see recognition of the soundness of the plan as brought out in the study by this division of the Metropolitan Life Insurance Co.

## Promote Public Swimming Pools

THE Portland Cement Association, Chicago, Ill., has issued two folders on swimming pools to encourage construction in various communities. The first folder, "How can we get a swimming pool?" describes methods of organizing a public interest campaign to promote a pool. The second, "These towns have swimming pools —so can yours," shows how certain communities have financed their pools and cites the plans used as examples that may be followed in other localities for organizing campaigns to obtain construction funds.

## Asks Aid of Court in Clearing Control of Company

AN ANSWER filed in the supreme court in Lincoln, Neb., April 6, by the Allis Sand and Gravel Co. of Omaha asked that a share in that concern held by the Lyman-Richey Sand and Gravel Co. of Omaha and Fremont be quieted and title in gravel producing lands in Douglas county be vested in the Allis company.

The petition was in answer to an original action filed recently by Attorney General Sorensen charging the Lyman-Richey company with operating in restraint of trade and asking dissolution of its various companies of which the Allis concern was cited as one.

The answer contained a general admission of the allegations of the Sorensen petition, and charged Horatio F. Curtis, head of the Lyman-Richey company, gained possession of a third interest through Bernard Wickham of the National Construction Co. of Omaha, without the consent of H. J. M. Petersen and Clyde Drew, the remaining stockholders.—*Omaha* (Neb.) *Bee-News.*

## Federal Trade Commission's Investigation of the Cement Industry

IN A PROGRESS report on its investigation of the portland cement industry the Federal Trade Commission says: "The investigation of competitive conditions in the cement industry involves an inquiry as to whether activities of trade associations of manufacturers of cement or of dealers in cement constitute violations of the anti-trust laws. In addition to the field work, which is practically completed, information has been received through questionnaire letters addressed to manufacturers, state highway commissions, dealers, contractors, and ready-mixed concrete companies. During the month, information was received from practically all manufacturers in response to a request for up-to-date information on production, sales, and prices. Work has been begun on classifying and assembling the information in the files, with a view to preparing a report."

## Dance Hall "Slip" from Wyoming Mine

By Jos. C. Coyle

THE Labbe Manufacturing Co., Denver, Colo., has developed a deposit of a crystalline talc, or magnesium silicate, near Wheatland, Wyo., which is peculiarly adapted to use in certain manufacturing industries, including manufacture of rubber goods and roofing. The talc is also being manufactured by the company into a product of their own called "Slip-er-e" dance floor powder. Besides an unusual degree of smoothness in the pulverized talc the raw material has been subjected to a temperature of 1850 deg. F. without signs of disintegration.

At the mine two veins, one 24 in. thick and the other somewhat larger on the surface, have been developed about a mile apart. Both veins run from east to west, dipping northward at about 40 deg. The original discovery has been developed with a short slope and a quantity of the talc shipped.

Development work was done with two Wahl No. 93 jackhammers and a United States compressor, driven by a Fairbanks gasoline engine. One-ton, side-dump, mine cars, furnished by the Morse Machinery Co. of Denver, are used in the tunnel, being moved so far by hand. The deposit is six miles from a railroad.

The talc is reduced to 2-in. size and under in a 10-in. jaw crusher at the mine. It is then sacked and shipped to the mill in Denver, where it is reduced to a maximum of ¼-in. in an Ideal gyratory crusher and finally pulverized in an Ideal centrifugal pulverizer, equipped with a Gayco separator, and driven by an Allis-Chalmers motor. Fineness of the product is regulated according to requirements of the manufacturers, the dance floor powder requiring an 85- to 110-mesh; roofing 60-mesh, and the rubber industry a 100% 150-mesh.

The raw talc as it is removed from the mine is capable of being shaped into blocks with saw or punch press. Its peculiar adaptability to various uses is expected to create a growing demand and additional machinery for manufacture is to be installed soon and development pushed to supply this demand.

## Appeals Decision on Trucking Rate

THE Lyman-Richey Sand and Gravel Co. of Omaha, Neb., has appealed to the district court in the refusal of the secretary of state and the state auditor to allow a claim of $4006 for hauling. The agreement between the state and the company on the price of gravel left a provision for the increase or decrease in freight rates. The gravel was hauled by truck and the state contends that there is no "freight" rate for trucking. The sand company, however, claims that truck rates are now so nearly uniform as to receive official recognition. The case is a test case and its outcome will establish the status of trucking rates. Testimony reveals that the Lyman-Richey company furnished for all but five state projects last year.—*Lodge Pole* (Kan.) *Express.*

## Authorize Reduced Gravel and Crushed Stone Rates

THE WISCONSIN public service commission has authorized railroads to establish reduced rates on gravel and crushed stone shipped from approximately 15 points in the state to the Milwaukee metropolitan area. The new rates, which went into effect April 8, are about 25% below the regular scale.—*Milwaukee* (Wis.) *Sentinel.*

## Display Flexible Stone

A ROCK that bends was placed on exhibition at the Philadelphia, Penn., Academy of Natural Sciences recently. It is sandstone from Brazil technically known as "itacolumnite." Scientists attribute its flexibility to its porous structure.

It is arranged in a glass case so that a lever can be pressed to make it bend.—*New York* (N. Y.) *American.*

# Portland Cement Production, March

THE PORTLAND CEMENT INDUSTRY in March, 1932, produced 4,847,000 bbl., shipped 3,973,000 bbl. from the mills, and had in stock at the end of the month 27,530,000 bbl. Production of portland cement in March, 1932, showed a decrease of 41.2% and shipments a decrease of 44.8% as compared with March, 1931. Portland cement stocks at the mills were 7.2% lower than a year ago.

The statistics here presented are compiled from reports for March, received by the Bureau of Mines from all manufacturing plants except three, for which estimates have been included in lieu of actual returns.

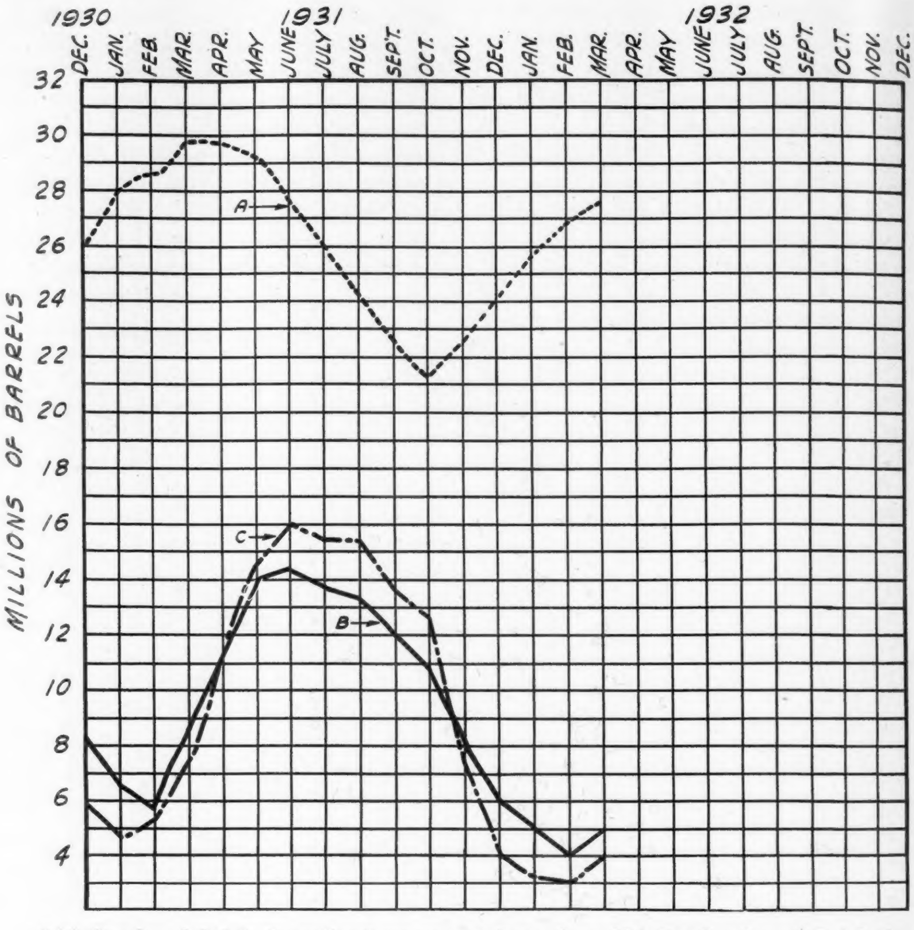
In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of March, 1932, and of March, 1931. The estimates include increased capacity due to extensions and improvements during the period.

RELATION OF PRODUCTION TO CAPACITY

| | Mar. 1931 Pct. | Mar. 1932 Pct. | Feb. 1932 Pct. | Jan. 1932 Pct. | Dec. 1931 Pct. |
|---|---|---|---|---|---|
| The month | 36.9 | 21.3 | 18.7 | 22.0 | 26.4 |
| 12 months ended | 58.6 | 43.8 | 45.2 | 45.9 | 46.5 |

***Distribution of Cement***

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during January and February, 1931 and 1932.




***(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories***

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN JANUARY AND FEBRUARY, 1931 AND 1932, IN BARRELS*

| Shipped to | 1931—January | 1932 | 1931—February | 1932 |
|---|---|---|---|---|
| Alabama | 88,798 | 29,065 | 103,610 | 27,589 |
| Alaska | 11 | 132 | 159 | 0 |
| Arizona | 36,015 | 12,426 | 36,834 | 8,383 |
| Arkansas | 54,904 | 19,588 | 43,685 | 22,280 |
| California | 580,888 | 371,260 | 532,384 | 301,852 |
| Colorado | 20,937 | 13,598 | 32,603 | 18,392 |
| Connecticut | 40,081 | 37,618 | 40,716 | 24,687 |
| Delaware | 10,916 | 13,150 | 15,566 | 12,842 |
| District of Columbia | 53,960 | 59,606 | 56,388 | 70,548 |
| Florida | 64,038 | 27,586 | 60,601 | 27,805 |
| Georgia | 83,687 | 100,950 | 81,500 | 92,049 |
| Hawaii | 24,971 | 16,983 | 28,265 | 15,765 |
| Idaho | 4,465 | 2,359 | 7,472 | 2,987 |
| Illinois | 195,146 | 103,901 | 227,023 | 109,850 |
| Indiana | 79,310 | 48,366 | 108,914 | 59,591 |
| Iowa | 30,333 | 22,943 | 73,262 | 20,162 |
| Kansas | 70,951 | 27,495 | 111,835 | 36,309 |
| Kentucky | 56,581 | 44,852 | 73,215 | 47,017 |
| Louisiana | 133,695 | 77,633 | 156,356 | 62,045 |
| Maine | 8,263 | 6,847 | 9,015 | 4,513 |
| Maryland | 48,532 | 87,662 | 71,391 | 57,752 |
| Massachusetts | 106,524 | 87,756 | 69,184 | 67,952 |
| Michigan | 174,367 | 92,394 | 170,815 | 96,588 |
| Minnesota | 46,987 | 31,018 | 62,726 | 26,585 |
| Mississippi | 37,644 | 14,040 | 31,532 | 11,977 |
| Missouri | 167,209 | 77,383 | 182,133 | 85,579 |
| Montana | 9,502 | 3,494 | 10,912 | 3,062 |
| Nebraska | 16,464 | 6,897 | 49,142 | 11,655 |
| Nevada | 2,455 | 10,308 | 6,231 | 12,238 |
| New Hampshire | 6,586 | 7,667 | 7,359 | 4,638 |
| New Jersey | 135,679 | 165,341 | 151,941 | 127,933 |
| New Mexico | 12,200 | 6,292 | 14,839 | 14,749 |
| New York | 653,705 | 590,166 | 622,266 | 469,466 |
| North Carolina | 30,352 | 37,779 | 42,771 | 36,507 |
| North Dakota | 2,737 | 942 | 5,790 | 1,395 |
| Ohio | 188,631 | 161,775 | 219,903 | 171,138 |
| Oklahoma | 115,140 | 81,230 | 125,682 | 94,218 |
| Oregon | 36,696 | 26,097 | 38,148 | 26,001 |
| Pennsylvania | 323,776 | 251,407 | 343,903 | 224,350 |
| Porto Rico | 620 | 2,725 | 1,020 | 1,751 |
| Rhode Island | 13,249 | 22,151 | 11,454 | 8,594 |
| South Carolina | 170,545 | 33,652 | 208,443 | 30,897 |
| South Dakota | 6,533 | 3,721 | 21,300 | 3,503 |
| Tennessee | 65,246 | 36,629 | 56,391 | 36,126 |
| Texas | 327,904 | 255,469 | 309,196 | 285,206 |
| Utah | 6,075 | 6,730 | 13,991 | 6,402 |
| Vermont | 2,869 | 2,937 | 2,014 | 4,618 |
| Virginia | 61,804 | 64,365 | 81,003 | 57,936 |
| Washington | 110,948 | 45,904 | 129,223 | 45,674 |
| West Virginia | 52,512 | 45,752 | 56,430 | 47,007 |
| Wisconsin | 66,531 | 54,214 | 85,088 | 46,972 |
| Wyoming | 4,854 | 1,261 | 5,333 | 2,553 |
| Unspecified | 25,533 | 15,671 | †23,271 | 0 |
| | 4,668,359 | 3,367,187 | †5,030,228 | 3,085,688 |
| Foreign countries | 23,641 | 25,813 | †43,772 | 32,312 |
| Total shipped from cement plants | 4,692,000 | 3,393,000 | 5,074,000 | 3,118,000 |

*Includes estimated distribution of shipments from two plants in January, 1932; from three plants in January, 1931, and February, 1932; from four plants in February, 1931. †Revised.

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1931 AND 1932, IN BARRELS

| Month | 1931—Production | 1932 | Stocks at end of month 1931 | 1932 |
|---|---|---|---|---|
| January | 8,129,000 | 6,107,000 | 10,384,000 | 8,184,000 |
| February | 7,473,000 | 5,176,000 | 11,946,000 | *9,375,000 |
| March | 9,586,000 | 5,443,000 | 13,318,000 | 10,013,000 |
| April | 11,540,000 | ........ | 13,854,000 | ........ |
| May | 13,159,000 | ........ | 13,087,000 | ........ |
| June | 12,679,000 | ........ | 11,837,000 | ........ |
| July | 12,246,000 | ........ | 10,209,000 | ........ |
| August | 11,664,000 | ........ | 8,468,000 | ........ |
| September | 10,414,000 | ........ | 6,918,000 | ........ |
| October | 9,825,000 | ........ | 6,021,000 | ........ |
| November | 8,259,000 | ........ | 6,215,000 | ........ |
| December | 6,840,000 | ........ | 7,035,000 | ........ |

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN MARCH, 1931 AND 1932, AND STOCKS IN FEBRUARY, 1932, IN BARRELS

| District | Production 1931—March | Production March—1932 | Shipments 1931—March | Shipments March—1932 | Stocks at end of month 1931 | Stocks at end of month 1932 | Stocks at end of Feb., 1932* |
|---|---|---|---|---|---|---|---|
| Eastern Penn., N. J. & Md. | 2,293,000 | 1,509,000 | 1,724,000 | 978,000 | 6,622,000 | 6,237,000 | 5,706,000 |
| New York and Maine | 437,000 | 570,000 | 381,000 | 237,000 | 2,013,000 | 1,909,000 | 1,575,000 |
| Ohio, West'n Penn., W. Va. | 444,000 | 241,000 | 595,000 | 269,000 | 3,565,000 | 3,377,000 | 3,405,000 |
| Michigan | 72,000 | 53,000 | 286,000 | 128,000 | 2,600,000 | 2,017,000 | 2,093,000 |
| Wis., Ill., Ind. & Ky. | 797,000 | 688,000 | 526,000 | 256,000 | 4,237,000 | 3,817,000 | 3,386,000 |
| Va., Tenn., Ala., Ga., Fla., La. | 942,000 | 300,000 | 1,061,000 | 448,000 | 1,714,000 | 1,601,000 | 1,749,000 |
| East'n Mo., Ia., Minn., S. D. | 869,000 | 325,000 | 494,000 | 243,000 | 3,833,000 | 3,808,000 | 3,726,000 |
| West'n Mo., Nebraska, Kansas, Oklahoma and Arkansas | 638,000 | 251,000 | 520,000 | 288,000 | 2,196,000 | 1,905,000 | 1,942,000 |
| Texas | 489,000 | 304,000 | 456,000 | 380,000 | 773,000 | 771,000 | 847,000 |
| Colo., Mont., Utah, Wyo., Ida. | 192,000 | 39,000 | 126,000 | 64,000 | 552,000 | 431,000 | 456,000 |
| California | 830,000 | 521,000 | 770,000 | 547,000 | 998,000 | 1,098,000 | 1,124,000 |
| Oregon and Washington | 242,000 | 46,000 | 253,000 | 135,000 | 573,000 | 559,000 | 648,000 |
| | 8,245,000 | 4,847,000 | 7,192,000 | 3,973,000 | 29,676,000 | 27,530,000 | 26,657,000 |

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1931 AND 1932, IN BARRELS

| Month | 1931—Production | Production—1932 | 1931—Shipments | Shipments—1932 | Stocks at end of month 1931 | Stocks at end of month 1932 |
|---|---|---|---|---|---|---|
| January | 6,695,000 | 5,026,000 | 4,692,000 | 3,393,000 | 27,759,000 | 25,778,000 |
| February | 5,920,000 | 3,971,000 | 5,074,000 | 3,118,000 | 28,612,000 | *26,657,000 |
| March | 8,245,000 | 4,847,000 | 7,192,000 | 3,973,000 | 29,676,000 | 27,530,000 |
| April | 11,245,000 | ........ | 11,184,000 | ........ | 29,715,000 | ........ |
| May | 14,010,000 | ........ | 14,200,000 | ........ | 29,554,000 | ........ |
| June | 14,118,000 | ........ | 16,077,000 | ........ | 27,602,000 | ........ |
| July | 13,899,000 | ........ | 15,545,000 | ........ | 25,934,000 | ........ |
| August | 13,549,000 | ........ | 15,172,000 | ........ | 24,313,000 | ........ |
| September | 12,092,000 | ........ | 13,671,000 | ........ | 22,736,000 | ........ |
| October | 10,762,000 | ........ | 12,360,000 | ........ | 21,218,000 | ........ |
| November | 8,161,000 | ........ | 7,156,000 | ........ | 22,219,000 | ........ |
| December | 5,974,000 | ........ | 4,142,000 | ........ | *24,098,000 | ........ |
| | 124,570,000 | ........ | 126,465,000 | ........ | ........ | ........ |

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN MARCH, 1931 AND 1932, IN BARRELS

| District | 1931—Production | Production—1932 | Stocks at end of month 1931 | Stocks at end of month 1932 |
|---|---|---|---|---|
| Eastern Pennsylvania, New Jersey and Maryland | 2,489,000 | 1,560,000 | 1,893,000 | 1,232,000 |
| New York and Maine | 669,000 | 635,000 | 1,314,000 | 793,000 |
| Ohio, Western Pennsylvania and West Virginia | 623,000 | 229,000 | 1,645,000 | 1,107,000 |
| Michigan | 382,000 | 214,000 | 1,852,000 | 979,000 |
| Wisconsin, Illinois, Indiana and Kentucky | 980,000 | 954,000 | 1,741,000 | 1,381,000 |
| Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana | 962,000 | 240,000 | 897,000 | 736,000 |
| Eastern Missouri, Iowa, Minnesota and South Dakota | 1,137,000 | 365,000 | 1,006,000 | 455,000 |
| Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas | 716,000 | 260,000 | 871,000 | 812,000 |
| Texas | 430,000 | 330,000 | 300,000 | 267,000 |
| Colorado, Montana, Utah, Wyoming and Idaho | 203,000 | 0 | 287,000 | 150,000 |
| California | 813,000 | 606,000 | 1,085,000 | 1,724,000 |
| Oregon and Washington | 182,000 | 50,000 | 427,000 | 377,000 |
| | 9,586,000 | 5,443,000 | 13,318,000 | 10,013,000 |

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1931 AND 1932

| Month | 1931—Exports Barrels | 1931 Value | Exports—1932 Barrels | 1932 Value | 1931—Imports‡ Barrels | 1931 Value | Imports‡—1932 Barrels | 1932 Value |
|---|---|---|---|---|---|---|---|---|
| January | 41,199 | $ 115,678 | 36,704 | $ 82,984 | 95,609 | $ 120,298 | 14,375 | $ 16,648 |
| February | 25,703 | 88,989 | 12,889 | 39,350 | 21,984 | 25,391 | 83,706 | 69,197 |
| March | 54,599 | 144,579 | ........ | ........ | 70,378 | 80,360 | ........ | ........ |
| April | 40,478 | 116,564 | ........ | ........ | 53,333 | 58,576 | ........ | ........ |
| May | 48,028 | 140,953 | ........ | ........ | 19,325 | 20,568 | ........ | ........ |
| June | 43,597 | 107,610 | ........ | ........ | 32,079 | 42,955 | ........ | ........ |
| July | 29,344 | 97,837 | ........ | ........ | 14,332 | 15,582 | ........ | ........ |
| August | 39,517 | 106,643 | ........ | ........ | 8,895 | 11,739 | ........ | ........ |
| September | 27,570 | 81,399 | ........ | ........ | 33,574 | 33,520 | ........ | ........ |
| October | 24,531 | 68,524 | ........ | ........ | 39,642 | 42,380 | ........ | ........ |
| November | 33,200 | 97,796 | ........ | ........ | 27,940 | 22,235 | ........ | ........ |
| December | 21,887 | 54,028 | ........ | ........ | 40,147 | 34,314 | ........ | ........ |
| | 429,653 | $1,220,600 | ........ | ........ | 457,238 | $507,918 | ........ | ........ |

### *Exports* and Imports†*

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN FEBRUARY, 1932

| Exported to | Barrels | Value |
|---|---|---|
| Canada | 286 | $ 1,571 |
| Central America | 988 | 2,535 |
| Cuba | 797 | 1,224 |
| Other West Indies | 921 | 1,760 |
| Mexico | 2,032 | 5,824 |
| South America | 5,845 | 16,448 |
| Other countries | 2,020 | 9,988 |
| | 12,889 | $39,350 |

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN FEBRUARY, 1932

| Imported from | District into which imported | Barrels | Value |
|---|---|---|---|
| Belgium | Massachusetts | 19,047 | $20,049 |
| Canada | Maine & N. H. | 10 | 18 |
| Cuba | Porto Rico | 1,263 | 1,875 |
| Denmark | Porto Rico | 12,524 | 8,196 |
| Japan | Hawaii | 2,575 | 2,122 |
| United Kingdom | New York | 48,287 | 36,937 |
| | Total | 83,706 | $69,197 |

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO IN FEBRUARY, 1932

| | Barrels | Value |
|---|---|---|
| Alaska | 64 | $ 194 |
| Hawaii | 11,225 | 32,564 |
| Porto Rico | 1,712 | 2,313 |
| | 13,001 | $35,071 |

*The value of exports of domestic cement is the actual cost at the time of exportation in the ports of the United States whence they are exported, as declared by the shippers on the export declarations.

†The value of imported cement represents the foreign market value at the time of exportation to the United States.

‡Includes hydraulic cement clinker and white nonstaining portland cement.

## Sand-Lime Brick Production and Shipments in March

THE FOLLOWING DATA are compiled from reports received direct from 23 producers of sand-lime brick, located in various parts of the United States and Canada. The accompanying statistics may be regarded as representative of the industry in the United States and Canada.

The number of sand-lime brick plants reporting for the month of March is five more than reported for February—statistics for which were published in our issue of March 26. Figures for the month of March indicate that production remains about the same as in the previous month. A decrease is shown in rail shipments, but truck shipments increased somewhat. Stocks on hand remain about the same, while unfilled orders show a slight increase.

### *Average Prices for March*

| Shipping point | Plant price | Delivered |
|---|---|---|
| Detroit, Mich. | $11.00 | $12.50‡ |
| Flint, Mich. | 11.50 | 15.00 |
| Grand Rapids, Mich. | ........ | 13.50 |
| Jackson, Mich. | 13.00 | ........ |
| Madison, Wis. | 12.50* | 14.00† |
| Menominee, Mich. | 10.50 | 13.25 |
| Milwaukee, Wis. | 7.50 | 10.50 |
| Minneapolis, Minn. | 6.50 | 8.50 |
| Mishawaka, Ind. | 10.00 | ........ |
| Pontiac, Mich. | 12.50 | 14.50 |
| Saginaw, Mich. | 11.00 | ........ |
| Syracuse, N. Y. | 18.00 | 20.00 |
| Tampa, Fla. | 8.50 | ........ |
| Toronto, Ont., Can. | 11.40 | 13.50 |

*Less 50c. discount per M for payment 10th of month following invoice date. †Less $1 discount per M for payment 10th of month. ‡To $14.50.

### *Statistics for February and March*

| | *February | †March |
|---|---|---|
| Production | 1,538,450 | 1,603,155 |
| Shipments (rail) | 165,180 | 125,275 |
| Shipments (truck) | 1,580,106 | 2,088,876 |
| Stocks on hand | 8,255,238 | 8,421,283 |
| Unfilled orders | 8,306,000 | 8,914,000 |

*Eighteen plants reporting. Incomplete, nine not reporting unfilled orders. †Twenty-three plants reporting, incomplete, one not reporting production and six not reporting unfilled orders.

## Canadian Gypsum Production

GYPSUM PRODUCTION in Canada amounted to 5762 tons in January, according to a report issued by the Dominion Bureau of Statistics at Ottawa. In December production totaled 53,207 tons and in January last year 10,000 tons were produced.

Customs' records show an export of 60,009 tons of crude gypsum to the United States in January. It may be assumed that this tonnage consisted of gypsum mined in 1931 and stored on shipping docks awaiting exportation to the United States. Canadian producers shipped 226 tons of plaster of Paris valued at $3638 as compared with 133 tons worth $2008 in December.

## Feldspar Production

THE JANUARY production of feldspar in Canada was 800 tons as compared with 591 tons in December and 600 tons in January, 1931, according to the Dominion Bureau of Statistics at Ottawa.

Ground feldspar imported into Canada in January totaled 170 tons appraised at $3289; in December, 123 tons worth $3127 were imported. Customs' records show 28 tons of crude feldspar brought into Canada from the United States in January.

# Traffic and Transportation

## Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week ending Apri 16:

### NEW ENGLAND FREIGHT ASSOCIATION DOCKET

25035. **Common sand and run of bank or screened or crushed gravel**, carloads (See Note 3), from Westboro, N. H., to points in Vermont (rates in cents per 2000 lb.):

| To | Pres. | Prop. | To | Pres. | Prop. |
|---|---|---|---|---|---|
| E. Ryegate.. | 120 | 100 | Inwood ........ | 125 | 100 |
| McIndoes .... | 120 | 100 | Passumpsic.. | 125 | 100 |
| Barnet .......... | 125 | 100 | | | |

(See Note 4.)

### TRUNK LINE ASSOCIATION DOCKET

28926. Cancel B. & O. R. R., I. C. C. 21121, which names rates on **sand and gravel**, carloads (See Note 2), from Holmes, W. Va., to various destinations on the B. & O. R. R. and Monongahela Ry. Reason—Investigation develops no traffic has moved for some time nor is there prospects for future shipments, therefore rates are obsolete.

28952. **Sand** (other than blast, engine, foundry, glass, molding or silica) **and gravel**, carloads (See Note 2), from Alpha, N. J., to L. V. R. R. stations, Kennedy, N. J., to Grandin, N. J., inclusive, 60c; Pittstown, N. J., to Flemington Jct., N. J., inclusive, 70c per net ton. (See Note 5.)

28975. **Crushed stone, coated with oil, tar or asphaltum**, carloads (See Note 2), from White Haven, Penn., to Honesdale, Penn., $1.40 per net ton, and Dunmore, Avoca and Sebastopol, Penn., $1.15. Reason—Proposed rates are comparable with rates to Scranton, Hawley, Elmhurst, Penn., Port Jervis, N. Y., etc.

28985. To increase rate of $1 to $1.10 per net ton on **sand**, in open top cars, without tarpaulin or other protective covering, carloads (See Note 2), from Mapleton District, Penn., to Diamond Smokeless Collieries Nos. 1 and 2, Penn. Reason—To conform with mileage scale in P. S. C. of Penn. order in Docket No. 7950.

28991. **Stone, crushed or broken**, carloads (See Note 2), from Oriskany Falls, N. Y., to D. L. & W. R. R. stations, Binghamton, Oxford, Galena, Hubbardsville, Bridgewater, Cedarville, Richfield Springs, Chadwick, Washington Mills and various. Rates ranging from 90c to $1.10 per net ton. (See Note 5.)

28998. **Stone, crushed or broken, coated with oil, tar or asphaltum**, carloads (See Note 2), from Oriskany Falls, N. Y., to N. Y. O. & W. Ry. stations. Rates ranging from 91c to $1.60 per net ton. Reason—Proposed rates are fairly comparable with rates from Jamesville, N. Y.

29000. Cancel commodity rate of 50c per net ton on **crushed stone and screenings**, carloads (See Note 2), from Ashcom, Penn., to Manns Choice, Penn., when in lots of ten cars or more at one time and apply in lieu thereof rate of 60c per net ton when shipped in lots of less than ten cars.

29002. **Gravel and sand**, N. O. I. B. N. in Official Classification, except blast, engine, foundry, glass, molding, quartz, silex and silica, in carloads (See Note 2), from Shickshinny, Penn., to Scranton, Penn., 70c per net ton. (Present rate 80c.) Reason—Proposed rate is comparable with rate from Falls, Penn., to Scranton, Penn.

29005. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand) **and gravel**, carloads (See Note 2), from Junius, N. Y., to Dundee, N. Y., 75c, and Barnes and Reading Center, N. Y., 80c per net ton. From Oaks Corners, N. Y., to Barnes and Reading Center, N. Y., 80c per net ton. (See Note 5.)

29006. To amend P. & L. E. R. R. Tariffs I. C. C. Nos. 2925 and 3008 by eliminating **broken stone** from the description and ratings applicable to stone, crushed, screenings (including crushed limestone and limestone screenings) and establish the proper rates on broken stone by including same with rates on stone, viz., rip rap, rough building (not cut to dimension), rough quarried, rubble and spalls, carloads, minimum weight 90% of marked capacity of car.

29012. **Gravel and sand** (other than blast, engine, fire, glass, molding or foundry, quartz, silex and silica), carloads (See Note 2), from Baltimore, Md., to Seven Stars, Penn., $1 per net ton. (Present rate, $1.40. (See Note 5.)

M-2097. To revise all commodity rates on **crushed stone, coated with oil, tar and asphalt**, carloads, from points in New York state to all points in Trunk Line territory to be not less than 10c per ton higher than the current rates on crushed stone, not coated with oil, tar or asphalt.

29020. **Limestone** (finely ground), carloads, minimum weight 50,000 lb., from Annville, Penn., to Atlantic City, N. J., 16c per 100 lb. Present rate, 18c per 100 lb. Reason—Proposed rate is comparable with rates from Annville, Penn., to Absecon, N. J.

29029. **Stone, broken or crushed, coated or uncoated with tar, asphaltum or oil**, carloads (See Note 2), from Oriskany Falls, N. Y., to D. L. & W. R. R. stations—Green Ridge, Old Forge, Pittston, Luzerne, Plymouth, Avondale, Clarks Summit, Glenburn, Nicholson, Foster, Hallstead, Penn., Vestal, Owego, N. Y., and various. Rates ranging from $1.20 to $1.95 per net ton on uncoated stone and rates on coated stone will be made 10c higher than rates on uncoated stone. Also establish on stone, broken or crushed, carloads, minimum weight 90% of marked capacity of car, from Munns, N. Y., to same D. L. & W. R. R. points, rates ranging from $1.20 to $1.95 per net ton. (See Note 5.)

**Note 1—Minimum weight marked capacity of car.**

**Note 2—Minimum weight 90% of marked capacity of car.**

**Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.**

**Note 4—Reason—To meet motor truck competition.**

**Note 5—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.**

### CENTRAL FREIGHT ASSOCIATION DOCKET

30748. Withdrawal notice. White Docket Advice No. 30748, Docket Bulletin No. 2126, dated March 2, 1932, covering proposal to establish rates on **sand**, carloads, from Glass Rock and South Zanesville, O., to Cambridge, Pleasant City, Caldwell and Marietta, O., is hereby withdrawn from the docket.

31053. To establish on **spent or refuse grinding sand**, carloads, from Butler, Penn., (A) to Mather, 130c; Monaca, 100c; Stoops Ferry, 110c; Bakerstown, Penn., 70c per net ton. (B) To Mather, 150c; Monaca, 115c; Stoops Ferry, 127c; Bakerstown, Penn., 81c per net ton. (A)—In open top equipment. (B)—In box cars. Present rates: To Mather, 16c; Monaca, 12c; Stoops Ferry, 13c; Bakerstown, Penn., 10c (sixth class) per Agent Curlett's Tariff 68 and C. F. A. L. Tariff 489.

31056. To establish on **crushed stone**, carloads, in open top equipment, carloads (See Note 3), from Bascom, O., to Lorain, 80c; Painesville, 90c; Wooster, East Akron, 80c; Spring Mills, 60c; Lexington, 80c; Beach City, 90c; Cuyahoga Falls, Botzum, 80c; Niles, O., 100c per net ton. Present: 90c to Lorain; 110c, Painesville; 90c, Wooster and East Akron; 70c, Spring Mills; 90c, Lexington; 130c, Beach City; 100c, Cuyahoga Falls; 90c, Botzum; 110c per net ton, Niles, O.

31059. To establish on **sand and gravel**, carloads, from Columbus, Ind., to Sunman, rate of 86c, and to Aurora, Ind., 99c per net ton. (Emergency charges in addition.) Present: 92c to Sunman and 105c per net ton to Aurora, Ind. (Emergency charges in addition.)

31073. To establish on **sand and gravel**, carloads, from Marion, O., to Bucyrus, O., rate of 60c per net ton. Present, 70c.

31084. To establish on **crushed stone**, carloads, from Findlay, O., to Defiance, 60c, and Hicksville, O., 70c per net ton, subject to emergency charges. Present—70c to Defiance and 80c to Hicksville, O. Route—Via B. & O. R. R. direct.

31098. To eliminate **broken stone** from commodity description and ratings applicable to crushed stone and crushed stone screenings (including crushed limestone and limestone screenings), from stations on the P. & L. E. R. R. to destinations located in Maryland, New York (western part), Ohio, Pennsylvania (western part), and West Virginia shown in P. & L. E. R. R. Tariffs I. C. C. Nos. 2925 and 3008, applying in lieu thereof rates on stone, rip rap, rough building, rough quarried, rubble and spalls, carloads.

31103. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, from Terre Haute, Ind., and West Terre Haute, Ind., to Stewardson, Ill., rate of 105c per net ton plus 6c emergency charge. Present rate, 14c.

31107. To establish on **crushed stone, crushed stone screenings and agricultural limestone** (not ground or pulverized), in bulk, in open top cars, carloads, from Bluffton, Ind., to points in Michigan, representative points of which are shown below: To White Pigeon, Constantine, 117c; to Florence, Three Rivers, Moorepark, Flowerville, 122c; Schoolcraft, 125c; Portage, 127c; Kalamazoo, Cooper, Argenta, 130c; Plainwell, Otsego, 132c; Abronia, Allegan, Miner Lake, 135c; Hopkins, Hilliards, 137c; Dorr, Herps, Byron Center, Wentworth, 140c; Grand Rapids, 142c per net ton. Route—Via N. Y. C. & St. L. R. R., Ft. Wayne, and N. Y. C. R. R. Present rates, sixth class.

31109. To establish on **crushed stone**, carloads, from North Baltimore, O., to Cromwell, 105c, and to Bremen, Ind., 125c per net ton. Present rates, 113c to Cromwell and 126c to Bremen, Ind.

31121. To establish on **crushed stone**, in open top cars, carloads (See Note 1), except when car is loaded to full cubical or visible capacity, from McVittys, O., to Brecksville and Cleveland, O., rate of 100c per net ton, to apply only via C. C. C. & St. L. Ry., Tiffin, O., thence B. & O. R. R. Present rates, 18c to Brecksville and 17c to Cleveland, O., sixth class.

31122. To establish on **sand and gravel**, in open top cars, carloads, from Kern, Ind., to Crawfordsville, Ind., rate of 65c per net ton, emergency increase in addition. Present rate, 70c, emergency increase in addition.

31124. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, from Ginger Hill and Rupel, Ind., to Millers, Ind., rate of 50c per net ton. Present rate, 70c per N. Y. C. Tariff I. C. C. L. S. 1413.

31129. To establish on **crushed stone**, in open top cars, carloads, from McVittys, O., to Cambridge, O., rate of 135c per net ton, emergency increase in addition. Present rate, 18c per 100 lb. or 360c per net ton (sixth class).

31133. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, from Hugo, O., to Cleveland, O., rate of 54½c per net ton. (Does not include emergency charge.) Present rate, 60c. (Does not include emergency charge.)

31134. To establish on **sand**, carloads, from Jackson, O., to McDermott, O., rate of 90c per net ton. Route—Via D. T. & I. R. R., Glen Jean, O., N. & W. Ry. Present rate, 13c (sixth class).

31139. To establish on **sand and/or gravel**, carloads (See Note 2), but not less than 40,000 lb., from Merom and Riverton, Ind., to C. & E. I. stations in Indiana, viz., Paxton, Carlyle, Oaktown, Busseron, Emison, 75c; Gravel Pit, Vincennes, 80c; Duncan, Purcell, Volmer, 85c; Decker, Hazelton, Miller, Patoka, 90c; Princeton, King, 95c; McGary, Owensville, Mounts, 100c; Knowles, Cynthiana, Poseyville, Wilson, 105c; Wadesville, Hepburn, Oliver, Springfield, Evansville, 110c; Ft. Branch, Haubstadt, Stacer, 100c; Ingle, 105c; Reliance, Phoenix, Shelburn, Farmersburg, Seifert, Pimento, 75c; Terre Haute, Brazil, 80c; Evans Lane, Keelers, Atherton, Lyford, Clinton, Jackson, 85c; Norton Creek and Summit Grove, 90c per net ton. Route—Via I. C. R. R., Sullivan, Ind., C. & E. I. Ry. Present—Class rates or combinations.

31140. To establish on **crushed stone**, in open top cars, carloads, from McVittys, O., to Batavia, O., rate of *135c per net ton. Present, *19c (sixth class).

*Emergency charge in addition.

### SOUTHWESTERN FREIGHT BUREAU DOCKET

24535. **Sand, crushed stone, gravel, etc.**, minimum weights on, between points in the Southwest, also between S. W. F. B. territory and W. T. L. territory. To amend committee and individual lines' tariffs applying on sand, crushed stone, gravel and other low-grade, heavy-loading commodities, to provide that minimum weight will be marked capacity of car, except when car is loaded to full cubical visible capacity actual weight w'l apply. Various

tariffs carry minimum weights on sand and gravel 90% of the stenciled capacity of cars used. The term "marked capacity" is interpreted to mean the old basis of stenciling cars at approximately 90% of the load limit. Freight cars are now quite generally stenciled to show the load limit; in fact, proponent states that practically all freight cars now in service are stenciled to show the load limit, as well as the nominal or so-called marked capacity. Proponent further states it is unquestionably a waste of car capacity to publish a tariff rule on low-grade commodities like sand, gravel and crushed stone at 90% of the marked capacity and believes that a far better rule would be marked capacity of car except when car is loaded to full cubical visible capacity actual weight to obtain.

### WESTERN TRUNK LINE DOCKET

2556-Y. Rates, **sand and gravel,** carloads (See Note 2), but not less than 40,000 lb., from Red Wing, Minn., to Missouri river points, Indices 1 to 22 as shown in first section of Item 2160, W. T. L. Tariff 1-T. Rates, present as shown in Item 2160 of the above tariff; proposed, 15½c per 100 lb.

6025-G. Minimum weight, **limestone, crushed or ground,** carloads, from Valmeyer, Ill., to Colorado common points. Minimum weight—Present, 90% of marked capacity, but not less than 40,000 lb.; proposed, 60,000 lb.

2556-Z. **Sand,** carloads (See Note 2), but not less than 40,000 lb., from Red Wing, Minn., to Racine and Beloit, Wis. Present rate, 190c per ton; proposed, 170c.

2292-J. **Stone, crushed** (See Note 1), from Ely, Minn., to South Bend, Ind., Lockland and Franklin, O. Present rates—To South Bend, Ind., 365c per net ton; to Lockland, O., 535c per net ton; to Franklin, O., 560c per net ton. Proposed—To South Bend, Ind., 333c; to Franklin and Lockland, 405c per net ton.

744-D. **Stone, crushed, rip rap and rubble,** in open top cars, carloads, from points in W. T. L. territory to points in C. F. A. territory. Description—Present, as shown in W. T. L. Tariff 49S; proposed, to restrict the rates on crushed stone, rip rap and rubble, carloads, to apply only in open top cars.

### ILLINOIS FREIGHT ASSOCIATION DOCKET

3718-I. **Sand,** carloads, minimum weight marked capacity of car, except when car is loaded to full visible capacity actual weight will apply, from Pekin, Alton, Lincoln and Mackinaw, Ill., to Springfield, Ill. Rates per net ton. Present, 70c; proposed, 50c.

5319-C. **Sand and gravel,** carloads, from Chillicothe, Ill., to stations on I. T. R. R. System. Rates per net ton to representative points in Illinois.

| | Pres. | Prop. | | Pres. | Prop. |
|---|---|---|---|---|---|
| Cash | $1.01 | $0.95 | Fravert | $1.01 | $0.95 |
| Summit | 1.01 | .95 | Mindale | 1.01 | .95 |
| Walnut | 1.01 | .95 | Sutter | 1.01 | .95 |

6571. **Sand and gravel,** carloads (See Note 1), from Brookport, Ill., to points on connecting lines in Illinois. Present, class or combination rates. Proposed, publish same rates from Brookport as now apply from Metropolis to points on connecting lines in I. C. R. R. Tariff 13321-G, I. C. C. A-10242.

## Proposed I. C. C. Decisions

**24823. Furnace Limestone.** M. J. Grove Lime Co. vs. B. & O. et al. By Examiner William B. Wilbur. Rates, crude, fluxing, foundry or furnace limestone, Stephens City, Va., to various points in Maryland, Pennsylvania, West Virginia, Ohio and Delaware, unduly prejudicial to the complainant and unduly preferential of its competitors at Martinsburg and Engle, W. Va., to the extent they exceeded or may exceed the contemporaneous rates from Martinsburg and Engle; also unreasonable to the extent they exceed or may exceed rates from Martinsburg and Engle. Examiner Wilbur said the undue prejudice should be removed by the publication of rates from Stephens City on a level with those from Martinsburg and Engle.

## Mileage Rates Condemned

APPROXIMATELY 40 traffic managers and other representatives of shippers from a dozen or more cities in the central west attended a meeting at Chicago, Ill., April 6, called by the St. Louis Shippers' Conference Association, to consider a program looking to elimination of mileage as a dominant factor in the determination of rates.

Plans for the creation of a national organization with the purpose of bringing about changes in existing transportation laws, or taking such other steps as might prove desirable to the end of curtailing the trend toward "frozen" rate structures, dominated largely by distance considerations, were discussed at length. Among the speakers were W. D. Goble, traffic manager, National Lime and Stone Co., Findlay, Ohio; and Frank E. Guy, traffic manager, Universal Atlas Cement Co., Chicago.

W. E. Rosenbaum, of the St. Louis Shippers' Conference Association, declared that industry after industry was being restricted to local distribution as a result of mileage scales ordered by the Interstate Commerce Commission. "Something has got to be done," he said. "The situation is getting desperate." He said that, at one time, he had been an advocate of the mileage basis for rates, but that that was before he had seen the practical results of applying such a theory to rate-making, as illustrated in the southwest in the last four years.

For the most part, the speakers were inclined to absolve the Interstate Commerce Commission from responsibility for the situation complained of.

On the other hand, a number of the speakers called attention to what they held to be a change in administration of relatively static law.

The fourth section of the interstate commerce act was roundly condemned by all who made reference to it and it was suggested that there should be a modification of section three in such a way that the Commission's administration of it might be liberalized.

With the exception of suggestions as to revisions of sections three and four of the act, nothing of a concrete nature was proposed as a program.

The meeting concluded with the adoption of a resolution empowering the chairman to appoint a committee, with himself as chairman, to draw up specific proposals with respect to revisions in transportation law and a program for a national organization, to be presented to a meeting in Chicago May 5.

## Sand and Gravel Producers Fight Rate Changes in Nebraska

REDUCED switching rate charges for sand and gravel near Fremont, Neb., to restore competitive conditions upset by elimination of absorption of switching charges in the emergency rates established by the state railway commission March 26 was in sight at the commission offices March 28, the *Lincoln Star* reports.

Representatives of the Schellberg Sand and Gravel Co. filed an application with the commission asking reduction of the switching charge from $6.30 to $2.25 at Fremont.

Meanwhile, Union Pacific officials notified the commission that they would submit an application asking the reduced switching charge. The commission indicated it would grant the reduction if asked by the railroad but declined to say what action would be taken otherwise.

The Schellberg firm in its application pointed out that although its pit is 1¼ mi. west of Fremont and that of the Lyman-Richey Sand and Gravel Co. is 6.17 mi. south of Fremont, the latter firm had been given 13c. a ton advantage on shipments to the north and east of Fremont by elimination of absorption of switching charges.

According to the *Sioux City* (Ia.) *Tribune,* small pit owners in northeastern Nebraska claim that if the shipper is made to pay the switching charges where transfer is made from one road to another the Lyman-Ritchie company will get most of the business because of the fact that it has pits located on nearly all the roads and will not be affected by these charges. It is claimed that if the reductions are not allowed by the commission the roads will be unable to meet truck and roadside competition.

## Protest Mississippi Gravel Rates

A NUMBER of heads of Columbus, Miss., gravel companies attended a hearing before the Mississippi Railroad Commission on April 6. They presented testimony in favor of a new schedule of gravel freight rates.

Last month two members of the railroad commission gave an informal hearing to the gravel producers. The purchasers protest that the local pits have been practically thrown out of business by the rates which went into effect January 17.—*Jackson* (Miss.) *News.*

## Foundry Association Fights Increase in Sand Rates

THE OHIO Foundries Association, representing 550 foundries, has requested permission to act as intervenor for the Ohio public utilities commission in protesting the reclassification of sand rates, which would mean an increase of 15% in rates. This proposed increase was discussed in ROCK PRODUCTS April 9.

## Harbor Rate on Bulk Sand, Gravel and Crushed Rock

BY ORDINANCE, the Los Angeles, Calif., council has approved the order of the harbor commission fixing a wharfage rate of 5c. per ton on rock, sand, gravel and ballast in bulk, handled over municipal wharves between vessel and car.—*Los Angeles* (Calif.) *Examiner.*

# Foreign Abstracts and Patent Review

**Manufacture of Plaster in France.** J. E. Duchez discusses first the dehydration of gypsum and the effect of variation in dehydration on the quality of plaster obtained, presenting also curves of burning tests. The time of set as affected by burning temperatures is then discussed and illustrated by diagrams. In the second part of the article the author discusses plaster burning in several types of kilns, including a recent French plant employing gypsum kettles. It is considered incontestable that the burning in the gypsum kettle with which the plaster burner can operate without a set temperature and time is more easily regulated than the burning in the rotary kiln with which the time of burning is fixed.

As to the chambered kiln, it does not permit any regulation. The curves of plaster set presented show the importance of control in gypsum burning; they show also that it is more easily possible to make rectifications with the burn in the kettle than with the burn in other kiln systems. Complete plans are shown for two plaster plants of 25 and 100 tons daily capacity, employing gypsum kettles.—*Revue des Materiaux de Construction et de Travaux Publics* (1931), Nos. 261 and 262.

**Magnesite for Cement Kiln Linings.** K. A. Goslich states that magnesite appears technically to be exceedingly well suited as cement kiln lining, for it contains as a rule over 90% of the strong base MgO, which cannot act as an acid against lime, as does alumina. Magnesite brick of good quality have also high resistance to wear. There is no danger of the magnesite causing unsoundness in cement, as it wears off too slowly in comparison to the amount of material passed, and besides, well sintered magnesite is under normal conditions not reactionable to cement. This was determined by Th. Klehe in 1926 as a result of observations within brief standardized periods, but now the results of the author's tests extending over five years are available.

One portland cement was mixed with 2% and another with 5% of well sintered magnesite ground as fine as cement; therefore with quantities which exceed by far the magnesite that could ever accumulate by wear from the linings in regular kiln operation. The drying and boiling tests were satisfactory, and also the air and water specimens observed through the period of five years, which gave compressive and tensile strengths in kg. per sq. cm. as shown below.

| Age and storage 1 + 3 mortar | Straight portland cement Tensile | Straight portland cement Compressive | Portland cement with 2% magnesite Tensile | Portland cement with 2% magnesite Compressive | Portland cement with 5% magnesite Tensile | Portland cement with 5% magnesite Compressive |
|---|---|---|---|---|---|---|
| Water storage: | | | | | | |
| 28 days | 30.0 | 447 | 26.0 | 440 | 27.2 | 413 |
| 3 months | 37.0 | 557 | 28.5 | 537 | 30.5 | 481 |
| 6 months | 35.2 | 527 | 36.2 | 599 | 33.2 | 523 |
| 1 year | 32.5 | 658 | 33.7 | 640 | 28.2 | 582 |
| 2 years | 34.0 | 645 | 29.7 | 658 | 28.7 | 607 |
| 5 years | 36.5 | 682 | 26.7 | 667 | 23.2 | 606 |
| Combined storage: | | | | | | |
| 28 days | 41.2 | 511 | 31.7 | 489 | 40.7 | 449 |
| 3 months | 38.0 | 493 | 41.0 | 533 | 42.5 | 549 |
| 6 months | 47.0 | 579 | 43.5 | 536 | 45.0 | 494 |
| 1 year | 48.5 | 584 | 40.5 | 491 | 48.2 | 560 |
| 2 years | 52.7 | 564 | 55.0 | 545 | 57.0 | 545 |
| 5 years | 73.0 | 647 | 74.0 | 655 | 76.5 | 682 |

These figures prove that the use of magnesite for cement kiln linings can have no detrimental effect on cement.—*Tonindustrie-Zeitung* (1931) **55**, 77, pp. 1081-1082.

**Change in Period of Set of Portland Cement Due to Storage.** Hellmut Weithase reviews the literature available on the subject of effect of storage of portland cement on its period of set, and reports also on his investigations. As early as 1878 it was stated that portland cement becomes in general slow setting as a result of storage. Under certain conditions, however, the period of set becomes shortened; and sometimes there occurs a "reversal" in set. When in 1908 the laboratory of the Association of German Portland Cement Manufacturers tested the setting periods of portland cement, after the cement had been stored for 3, 6, 9 and 12 months, there appeared to be a certain unmistakable uniformity in the behavior of all the cements, and within the individual periods of storage, in all cases the cements with short and mean periods of set extended their start of hardening and their period of set under the influence of storage, whereas the start of hardening and the period of set of the slow cements was shortened by extended storage. In every case the start and the end of the set varied in the same way in all experiments; if the hardening started sooner, then the total period of set was also shorter, and if the end of the set was retarded, then the start of the set was also later.

Then the author presents data on 55 cement specimens; in these the start of set and the period of set varied under certain conditions. In making these tests, the fineness of the cement, the normal period of set and the temperature of the mill in grinding the cement were considered, the cements under test having high strength, fineness and high lime content. In proper storage the periods of set remained practically constant. But when these cements were brought intimately in contact with the air for 24 hours by spreading them in a layer 20 to 40 mm. deep, after a short period of storage the initial set came sooner but the final set later than normally. In one cement the final set came sooner than normal, and in two cases the final set remained normal, while in 52 cements the final set extended in some cases to twice the original period. No relations between these variations, however, could be detected from the experiments.

In order to investigate the change in 24-hour set more closely, specimens of two cements were tested at 30-min. intervals, which indicated some irregularities in the course of the set, including an "apparent" start of set. Literature on the subject giving reasons for variations in the period of set traces these irregularities to a number of influences ranging from the influence of electrical tension of the air to sunshine itself.

According to one author, the original addition of water to the clinker makes a slow-set cement rapid set. According to another, the moistening of an originally quick setting cement makes it slow setting, which quality disappeared gradually until, after 45 days, the cement was again quick setting. One author recommended wetting the glowing clinker to regulate the period of set. According to one patent, superheated water vapor is used to lengthen the period of set. One author suggests the use of water vapor for regulating the period of set. Another traces the "reversal" and the "alternating reversal" to the formation and the disappearance of positive and negative catalyzers. According to another author, the mill heat can shorten the period of set, whereas another has never observed such an influence.

Weithase did not find any dependence of the period of set or the variation in the period of set upon the mill temperature. Nor could an influence of the fineness of the cement used be detected. It was found, however, that the atmosphere can influence the setting conditions; for example, cement protected from the air, that is, stored in a silo or in air-tight tin cans, did not vary in setting period; a change in the period of set of cement stored in paper sacks in a room free of draft was hardly noticeable after 100

days of storage, whereas cement stored in a paper sack in the open air in winter but protected from direct rain and snow underwent small changes in period of set. The initial and final set of a fine portland cement stored in air became slow.

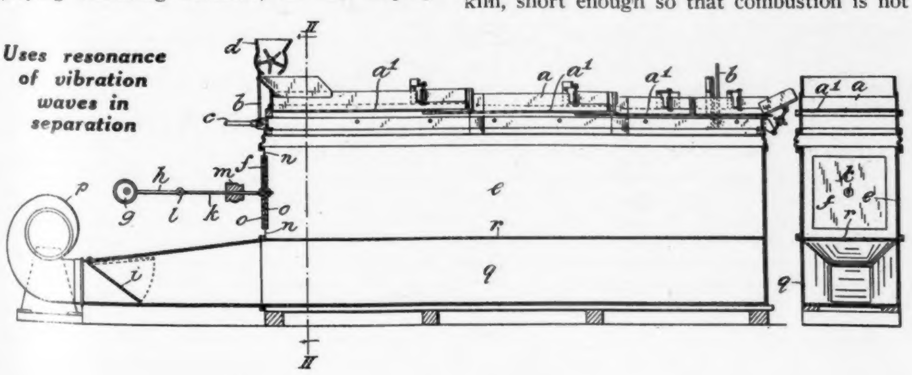
Tests on various kinds of cements in reference to the variation in set showed primarily the effect of a difference in lime content, a greater lime content effecting greater changes. Fineness of the cements was of importance only in that it increased the ability of reaction. The high lime content of the cements stored in air, that is, the carbonic acid contained in the air, probably exerts an influence upon the period of set, for when the cement was prepared with seltzer water instead of pure water, the same phenomena occurred as was obtained in storing the cement in air. The assumption that carbonic acid is the reacting agent is supported by analysis, for a fresh cement had no carbonic acid at a loss on ignition of 1.5%; but had about 0.5% at a loss on ignition of 3.5% after a storage of 24 hr. in air.

Yet, one author finds that after seven days of treatment in a flow of carbonic acid the period of set could be shortened artificially. Another author finds also a decrease in period of set, while still another finds once a long extension and another time a shortening of the period of set by treatment with carbonic acid. Weithase expresses the view, from the data available, that the carbonic acid can effect a decisive influence upon variations in the conditions of set, but that the nature and direction of its effect depends upon the cement itself, and first of all upon its chemical composition, especially upon its lime content.—*Zement* (1931), **20**, 9, pp. 187-192.

## Recent Process Patents

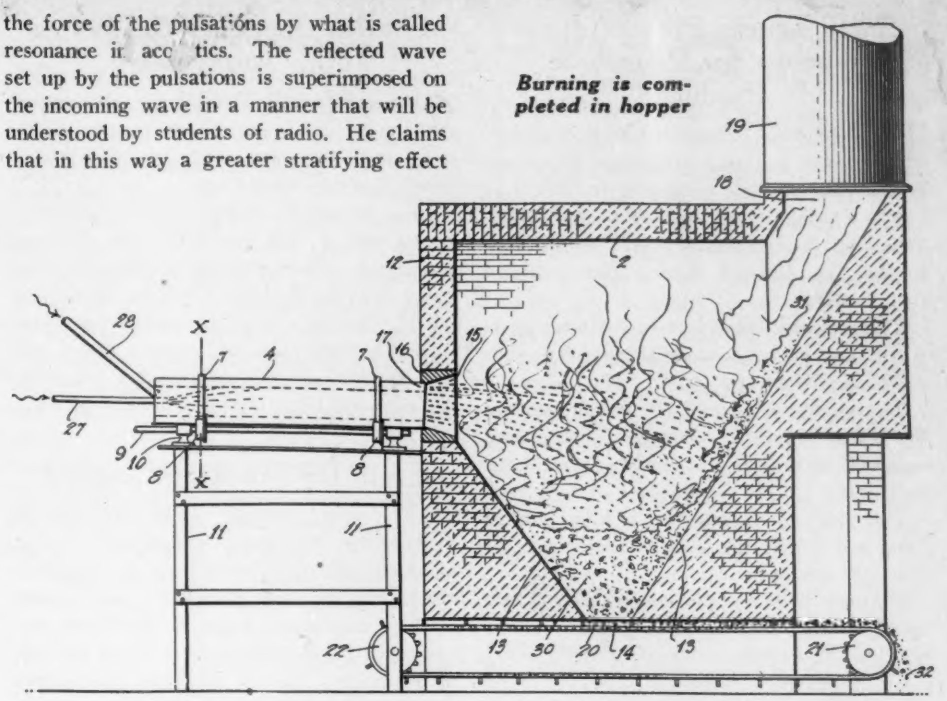
*The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.*

**Process for Separating Different Solid Materials of Different Specific Gravities.** The device shown is a dry concentrator having the usual pervious deck on which the material is stratified by a pulsating current of air that rises through the deck. But the inventor claims that by using pulsations of a certain frequency and making the dimensions of his machine right, and by employing reflecting surfaces, he can amplify the force of the pulsations by what is called resonance in acoustics. The reflected wave set up by the pulsations is superimposed on the incoming wave in a manner that will be understood by students of radio. He claims that in this way a greater stratifying effect may be given the material than has been given hitherto, one that will put the mass of grains in a practically liquid condition, allowing the heavy solids to settle freely through the lighter solids.—*George Raw, England, U. S. Patent* 1,811,026. (This is one of the most interesting patents that have been reviewed of late as it gives a quite new use to the same resonance that has been found such an annoyance in high speed machinery.—Editor.)



*Uses resonance of vibration waves in separation*

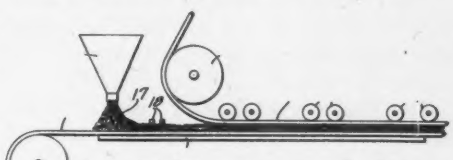
**Manufacture of Strontium Oxide.** Amorphous strontium carbonate is prepared by treating an aqueous solution of an alkaline strontium compound with $CO_2$ gas, sodium carbonate or other carbonic acid derivative. The dried precipitate is mixed with an equimolar amount of ashless carbon black and calcined at about 1200 deg. C. in a closed muffle. The resulting strontium oxide is soft and flaky and reacts readily with oxygen to make strontium peroxide by the method described by the patentee in a former patent.—*James B. Pierce, Assignor to Barium Reduction Corp., U. S. Patent* 1,790,107.



*Burning is completed in hopper*

**Lime Kiln.** The process described is for burning finely divided limestone. The stone and a fuel such as coal which is in small particles are put into a small rotary kiln, short enough so that combustion is not complete in the time that the material is in the kiln. The discharge goes to a large settling chamber, so large that the particles of limestone and burning fuel will settle into a hopper at the lower part of the chamber, and here the burning will be completed, the heat of the mass having a great deal to do with the reactions involved. The gases go to a flue which is far enough away from the discharge of the kiln so that the fine particles are not drawn into it. The hopper discharges through an opening at the bottom to a conveyor which removes the burned lime. *A. Ackerman, U. S. Patent* 1,812,672.

**Porous Acoustical Wallboard.** This patent is a continuation of the author's aplication, serial No. 278,537, filed May 17, 1928, and consists of a method of manufacturing a porous gypsum wallboard for use



*Wallboard of expanded gypsum and zonolite*

in sound control construction and any other use where a light-weight wallboard is desired. The patentee prepares a wallboard in the usual manner and incorporates treated zonolite with the gypsum matrix. Bubble-forming chemicals can also be added to the mix, further lightening the board. Once the board is formed it may be split by a suitable band saw, leaving the two faces of the gypsum-zonolite core exposed and presenting a board having a very pleasing appearance due to the sparkle of the gold colored zonolite. Such a split board naturally has only one paper cover sheet. *John H. Delaney, assignor to Ada W. Delaney, U. S. Patent No.* 1,778,008.

## Small Trucks Prove Advantageous for Phosphate Producer

THE Anderson Phosphate Mine at Garrison, Mont., started production in earnest in the fall of 1930, according to the *Deer Lodge* (Mont.) *Post,* and up to January 1, 1932, had shipped approximately 80,000 tons to the Consolidated Mining and Smelting Co., Trail, B. C.

The property comprises over 700 acres in which the main commercial phosphate bed underlies 278 acres.

The mining is carried on underground at five different levels. Over $40,000 has been expended in tunnels and mine betterment the past year.

The property is equipped with a modern camp and during the peak of operations last year 100 men were employed.

Shipping is at an approximate rate of 200 tons per day, but during September, October and November, the peak of the operation, the average monthly shipments were 8400 tons.

The property is situated 7.2 mi. from the railroad, and the first rock hauled in 1924 was transported in wagons drawn by six-horse teams. The product is a low grade rock, and horse transportation proved too slow and costly.

When the movement started in 1930 large trucks were used but proved too slow and the cost of transportation was entirely too high so that by August it was decided to abandon the operation. Later a trial of a light truck was made, and in August, 1930, the first Ford, a 1½-ton truck, was purchased. This proved such a success that three more Ford trucks were added to the fleet. The property has been in continuous operation ever since, and during this time 13 Ford trucks have been purchased and as high as 10 are in operation at a time.

The Ford trucks make an average of seven trips in nine hours and operating two shifts have transported an average load per truck during this time of approximately 6000 lb.

The Ford truck proved a solution of the haulage problem and transformed it to a profitable and flourishing industry.

The phosphate rock is shipped to the Consolidated Mining and Smelting Co. at Trail, B. C., which has a $10,000,000 fertilizer plant. The products are widely distributed over the Canadian prairies.

Although operations are curtailed at present, the mine will produce and ship to the Canadian plant 100,000 tons in 1932.

## To Remodel Hopper Cars for Bulk Cement

ORDERS have been placed with the Pennsylvania railroad's Enola car shops at Harrisburg, Penn., for the remodeling of 25 standard hopper cars for hauling cement in bulk. The new parts will be made at the Altoona works.—*Van Wert* (Ohio) *Times.*

## Charles Boettcher Celebrates 80th Anniversary

CHARLES BOETTCHER, president of the Ideal Cement Co. of Denver, Colo., celebrated his 80th birthday anniversary April 8 at his office there.

Mr. Boettcher's father was a hardware dealer and it was hardware that first engaged Mr. Boettcher's attention when he came to America from Germany at the age of 17. He is a large owner of the Great Western Sugar Co., of Denver, and it was as a result of one of his ideas that the growing of sugar beets in Colorado was stated.

## Form for Trucking Contract

AT a recent meeting of the Pennsylvania Stone Producers Association, a considerable discussion took place in regard to truck haulage and its effects on crushed stone competition. Paul B. Reinhold, secretary of the association, suggested the use of a standard form of contract. As a sample he submitted a form which he uses. It is reproduced herewith:

## Progress with Plan for Gravel Plant in Minnesota

SOME PROGRESS has been made towards a decision on the method of meeting the application of Foley Bros., St. Paul contractors, to the St. Peter, Minn., council for the right to operate a gravel washing plant on property adjacent the county fair grounds, with the use of water to be drawn from the river and discharged back to the river through private mains laid through streets of the city.

Though no formal motion was passed, it is reported as having been the sense of the council that a policy recommended by the attorney general of the state would be followed. This recommendation was that full acceptance of abutting property owners be obtained, after which a resolution be passed that might be revoked at the discretion of the council.

According to the *St. Peter Herald,* it is generally regarded that this solution of the question opens the way to a prompt settlement of the problem.

Date Due.................................. Requisition No..................................

Reinhold and Company, Inc.,
1422 Oliver Building,
Pittsburgh, Penn.

Gentlemen:

We are pleased to quote you the following prices for unloading, hauling and spreading the items mentioned below:

| Net Tons | Size of Stone | Description of the Job | Unloading Point and Railroad | Price |
|---|---|---|---|---|
| | | | | |

All work done and material handled based on the above prices shall be handled in accordance with the conditions shown below.

Very truly yours,

Date.................................. ..................................

Phone No.................................. By..................................

1. All material is to be delivered on the road in a manner satisfactory to the Department of Highways through its authorized agent in charge of the work.
2. The undersigned hauling contractor will be responsible for any and all siding charges, car service or any other charges which may accrue in the handling of this material.
3. The undersigned hauling contractor will be responsible and liable for any and all damages or losses whatsoever which may accrue out of the performance of this work.
4. The undersigned hauling contractor agrees to carry Liability Insurance to the extent of $25,000 to $50,000, or more, with:

..................................

Signed..................................

By..................................

## No Stagnation of Construction in California!

A RECENT SURVEY indicates that there will be approximately three-quarters of a billion dollars' worth of improvement work being done in southern California this year. These projects include dams, breakwaters, railway terminals, flood control projects, power development, factories, state and federal buildings, harbors, and aqueducts.

The largest among these developments is the Los Angeles-Colorado River Aqueduct, which will cost in the neighborhood of $220,000,000. The All-American Canal in Imperial Valley has been authorized at an expenditure of approximately $34,000,000.

## H. D. Ruhm to Operate as Research Consultant

THE RUHM Phosphate and Chemical Co., which recently removed its offices to Chicago, Ill., has decided to discontinue its research work in the development of new ideas for extending the use of its product, lime phosphate, as a fertilizer and will confine its efforts to sales in the territory already developed through this research.

H. D. Ruhm, vice-president, therefore is leaving the company May 1. He will continue his connection with the general phosphate and fertilizer interests independently and after May 1 will be located at 305 West Seventh St., Columbia, Tenn.

Mr. Ruhm will continue the work of lime phosphate production for special interests as well as his consulting work as a mining and chemical engineer.

## Committee on Mortars for Unit Masonry Elects Officers

AT A MEETING of Committee C-12 on Mortars for Unit Masonry of the American Society for Testing Materials held in Washington, D. C., February 29, permanent officers were elected as follows: Chairman, R. E. Davis, professor of civil engineering, University of California; vice-chairman, H. D. Baylor, vice-president, Louisville Cement Co.; vice-chairman, T. R. Lawson, head, department of civil engineering, Rensselaer Polytechnic Institute, and secretary, F. Leo Smith, technical secretary, structural service department, American Institute of Architects.

## Opens Quarry in Iowa

ANNOUNCEMENT has been made by Charles Pape, Dubuque, Ia., that he is to start quarry operations in the vicinity of Maquoketa and will install a crusher on acreage that he has acquired. Normal operation of plant has been assured through contracts held for material during 1932 and it is more than likely that a full time schedule will continue owing to increased road work lettings in that section.

## Ordinance Stimulates Repair Work

THE ORDINANCE passed by the Allentown, Penn., city council recently requiring property owners to repair their sidewalks has been the means of stimulating business in a direction from which little had been expected. Permits have been taken out in the highway department by a substantial number of property owners among the more than 300 that had been ordered to repair sidewalks or curbs, or both. Others are said to be waiting until the warm weather sets in definitely before proceeding with the work.

Taking the notice to property owners as a lead, many contractors, at present idle, or doing little business, have called on these owners and solicited orders for the work.

Under the ordinance, those who fail to make repairs to sidewalks 10 days after having received a notice from the city are liable to arrest under the general nuisance ordinance.—*Allentown* (Penn.) *Chronicle.*

## Test Effect of Blasting

FOUR TEST BLASTS were fired at the Belmont-Gurnee stone quarry while experts, equipped with a seismograph, took recordings of vibrations in the Woodcliff section of North Bergen, N. J.

A representative of the Bureau of Mines, who witnessed the tests, told Commissioner Buesser that he did not think the blasts were very damaging and that he would have no trouble in convincing a court of that fact.

The tests were arranged as a result of the recent effort of Mayor Reich to expedite solution of the blasting problem without waiting for a final adjudication of the restraining court action that had been started by Commissioner Buesser and which is still pending in Chancery Court.

In all, 2550 lb. of dynamite were fired in the blasts. The charges ranged from 450 to 850 lb.

A second series of test blasts will be fired soon.—*Jersey City* (N. J.) *Journal.*

## Powder Companies Combine

ON MARCH 1 the Peerless-Union Explosives Corp. was merged with the Atlas Powder Co. of Wilmington, Del., and all plants and business are now being handled by the Atlas company.

New Atlas sales offices, as a result of the combination, are at Tamaqua, Penn., and at Charleston, W. Va.

Other Peerless-Union sales offices will be consolidated with existing Atlas offices. Distribution activities of the Atlas Powder Co. will be enlarged.

Peerless-Union manufacturing plants at White Haven, Penn., Le Roy, N. Y., and Suscon, Penn., are added to the present Atlas plants.

## Citizens to Protest to State in Cement Ruling

THE ANNOUNCEMENT of the Wisconsin state highway commission that in the future contractors must buy their own cement, and the following announcement by officials of the Manitowoc Portland Cement Co. that the decision means the closing of the local plant, has aroused Manitowoc business men to action.

A public mass meeting to protest is planned by the Manitowoc Merchants and Manufacturers' Association and a delegation probably will go to Madison to protest to the governor and highway officials. A "complete airing of difficulties of the cement plant in negotiations with the state" was promised.—*Milwaukee* (Wis.) *Journal.*

## To Rebuild Crushed-Stone Plant Destroyed by Fire

FIRE, which started in one of the hoppers, soon spread beyond control at the Heumader Quarries plant, St. Joseph, Mo. Only a small office and a chute leading to the railroad track were left standing. No water was available to fight the flames.

William Heumader, president of the firm, said that work of rebuilding would be started at once. It would be several days before the quarry could resume operations, as new machinery must be purchased, Mr. Heumader said. When in full operation the quarry employs 50.—*St. Joseph* (Mo.) *News-Press.*

## Request City to Move Its Quarry

COMMISSIONER Taylor of Chattanooga, Tenn., recently was again requested to abandon the rock quarry located by the city in the vicinity of Avondale.

The delegation making the request was made up of members of the Avondale Garden Club. They insisted that the plant was a nuisance and an eyesore to the section.

Commissioner Taylor does not intend to take steps to relocate the plant, but promised the women to cooperate with them to any reasonable extent.

He said that the city had $3500 invested in the rock quarry property and that he did not propose to recommend that it be abandoned.—*Chattanooga* (Tenn.) *News.*

## Building Gravel Plant in Minnesota

THE CENTRAL States Construction Co., in preparation for its paving operations near Grand Rapids, Minn., is commencing the construction of a plant there.

A crew of men is now building a railroad spur from the Great Northern main line to the site of the plant. A screening, crushing and washing plant will be built. Gravel will be taken from a pit close at hand.—*Grand Rapids* (Minn.) *Independent.*

## To Develop Deposit of Vermiculite

VERMICULITE, a nonmetallic mineral also known as Jeffersite, used as an acoustical material and for insulation, is to be mined in the Beulah, Colo., district by the Nonmetallic Corp. of Chicago, Ill., on a royalty basis with Edmund F. Gobatti of the Edmund F. Gobatti Engineering and Machinery Co. of Pueblo, Colo.

Work will be started about the first of May with about 24 men, but within three months the crew is expected to be increased to about 75 men.

Negotiations are being completed for a semi-public road to the property. The product will be trucked to Pueblo, where it will be shipped to Illinois for handling.

Mr. Gobatti discovered the mineral in several test holes made by prospectors years ago. After determining that it could be mined on a profitable commercial basis, he obtained mineral rights on 240 acres of ground. The mine where the Vermiculite was discovered was formerly the Monongahela copper lode No. 32134, which was first discovered in May, 1863, and was worked until 1889.

Mr. Gobatti is also developing a nearby mica deposit for which he has secured mineral rights to 640 acres. He is now dealing with several mining companies to arrange a commercial project.

Several other persons are prospecting for nonmetallic minerals in the Beulah district and much of the land is being taken, including government grants in the San Isabel national forest.

Approximately 100,000 tons of mineral biotite, part of the mica family, has been uncovered south of Beulah, Colo., by Albert Burch and Joseph Dolhear.

The deposit is inaccessible at the present time, but is within two miles of good highway. Pueblo, 31 mi. away, is the nearest railroad shipping point.

Biotite is used for insulation purposes when ground up, in wallpaper manufacturing and as a lubricant in combination with grease or oil. The deposit is said to be only slightly acted upon by acids and is decomposed, leaving a residue of glistening scales of silica.

## New Pavement Awards

CONCRETE PAVEMENT yardage as awarded in the United States during February and for the period ending February 27 as reported by the Portland Cement Association follow:

| | Yardage awarded During March, 1932 | Yardage awarded To date, April 2, 1932 |
|---|---|---|
| Roads | 5,457,222 | 10,793,146 |
| Streets | 539,005 | 943,996 |
| Alleys | 9,015 | 47,154 |
| Totals | 6,005,242 | 11,784,296 |

## Opens Plant to Refine Talc

A NEW INDUSTRY has been established in the opening of the Moss Chemical Co. plant at Chatsworth, Ga., in the center of the talc mining region. Offices of the company are in Dalton.

Headed by Wade Moss, Jr., the Moss company has put into operation a new electro-chemical process which, it is claimed, will refine Georgia talc rock to a point where it can compete on even terms with the finest Italian talc. Although the process is secret, it is known that electro-chemical action plays a leading role in it and the application of this process is possible at such a low cost that the refined talc will be able to meet the price of imported talcs.

The plant is capable of producing 60 tons of refined talc weekly.—*Americus* (Ga.) *Recorder*.

## To Store Large Supply of Amiesite

ORDERS to rush to completion the clearing and grubbing of a strip of land along the quarry spur just south of the Amiesite plant at Carla, La., have been received by the local maintenance superintendent of the highway department, the *Winfield* (Va.) *Enterprise* reports.

It is stated that the highway commission will store along the quarry spur the unfinished part of the 1,000,000-ton order given the Louisiana Quarry Co. in December, 1930, which is reported to be about 300,000 tons.

Local highway employes say that they have no information as to when or where the stone now being put into storage will be used.

## Open Quarry in Wisconsin

KENNETH HODGINS and Marvin Fulcer have formed the Wolf Valley Stone Co. and will operate at the Hodgins quarry about a mile north of Hortonville, Wis. This quarry was operated up to 1900 by Mr. Hodgins' grandfather, but has been idle since.

The new firm has equipped its plant with the latest machinery, and operations were to start April 5. For the present crushed stone will be produced, but later pulverized limestone will be added.—*Hortonville* (Wis.) *Review*.

## Buys Elmont Rock Co.

PAUL SHERMAN, formerly president of the Victory Sand and Gravel Co., Topeka, Kan., announces he has sold his interest in that company and that he has purchased the Elmont Rock Co., Elmont, Kan.

The plant has been reconstructed and is now in operation. It has the contract to supply rock on the new $1,000,000 post office building in Topeka.

## Recent Prices Bid and Contracts Awarded

*Wooster, Ohio.* On five Medina county projects recently awarded, the average price for crushed stone was $1.82 per cu. yd.

*Fremont, Ohio.* Gottron Brothers have been awarded contract to supply stone at its plant at 80c. per ton for Nos. 1, 2, and 3; 85c. per ton for Nos. 4 and 6; and 60c. per ton for No. 7. Delivered prices are $1.10 per ton for Nos. 1, 2 and 3; $1.15 for Nos. 4 and 6, and 90c. per ton for No. 7.

*Montpelier, Ind.* Wells county board of commissioners has set 80c. per ton as the maximum price it would pay for stone on its trucks for county road work in 1932. A bid of 90c. per ton has been received.

*Binghamton, N. Y.* The Binghamton Crushed Stone and Gravel Co. submitted the low bid for washed sand and gravel to the city recently. For washed sand, the company submitted bid of $1.70, washed gravel (three sizes), $1.25, $1.40, and $1.50. The F. A. Rider Co. of Endicott presented a low bid of $1.55 for crushed gravel. Bids from all companies were the same, on crushed stone, being $1.97 a ton.

In addition, the Binghamton Crushed Stone and Gravel Co. offered a 2% discount for payment by the 10th of every month.

*Galesburg, Ill.* Recent bids for gravel for city work were: H. H. Guenther, $1.53½ per ton for river gravel; T. O. Miles, $1.61 per ton; E. L. Frederick, $1.60 per ton, and Tony Tomilanovich, $1.75.

*Los Angeles, Cal.* The California Portland Cement Co. has been awarded contract for 2485 bbl. of cement for the Sycamore wash concrete conduit at $2.40 per bbl.

*Troy, Ohio.* The Bowsman Washed Sand and Gravel Co. is the low bidder for county gravel for the Troy district, according to the bids tabulated and submitted to the county commissioners. The Bowsman bid is 70c. per cu. yd. at the pit for the type of gravel specified for the county. The other local gravel concerns submitted bids of 75c. per yd.

*Circleville, Ohio.* The Universal Sewer Pipe Co. of Columbus was awarded a contract to furnish 148 lin. ft. of 18-in. concrete sewer pipe at $1.20 per ft. and 8 lin. ft. of 36-in. sewer pipe at $3.60 per ft. The Sturm and Dillard Gravel Co. was awarded a contract to furnish 1600 tons of No. 6 gravel at 95c. per ton delivered and 800 tons of No. 46 gravel at $1.10 per ton to be used in Harrison township.

## To Build Foundry Sand Plant in Georgia

A NEW SAND PLANT is planned near Thomasville, Ga., to be operated by the Dawes Construction Co. of Thomasville, the *Atlanta American* reports. The plant will use sand taken from the Ochlocknee river and it will be utilized largely in supplying foundry requirements.

## Lime Industry to Hold Convention May 24-25

AN OFFICIAL ANNOUNCEMENT by Norman G. Hough, president of the National Lime Association, states: "On May 24 and 25, the 14th annual convention of the National Lime Association will be held at the Cleveland hotel, Cleveland, Ohio.

"It is imperative that this shall not be just another annual meeting. Unusually serious problems confront the industry. The committee in charge of convention arrangements is aware of this condition and recognizes the necessity for sound thinking and orderly action to guide the industry through this period of distress. The underlying thought will be to make this convention contribute to the solution of our current difficulties and to the prevention of their future recurrence.

"Those in charge are going to bed rock for material. There will be no non-essential topics or papers. All available time is to be devoted to the immediate and pressing needs of the industry. Stout-hearted, intelligent, positive action, such as we may confidently expect to result from the convention this year, will enable us better to bridge the difficulties immediately ahead and quicken our return to normal conditions.

"You are urged to attend this convention so that you may contribute to and benefit by the cooperation that results from good will and friendly contacts, and in order that the values created here may have a broader circulation resulting from a large attendance."

The announcement is addressed to *all* lime manufacturers irrespective of whether they are members of the National Lime Association or not.

## Light Weight Aggregate Developed in St. Louis

A ST. LOUIS, Mo., company, the General Aggregate Corp., has been formed for the manufacture and sale of a light-weight aggregate for concrete. The firm plans to establish a $150,000 crushing and screening mill, probably in Granite City, one of the officials has announced.

The company is headed by Claude H. Hunsaker, resident manager of the Massey Concrete Products Corp.; Bert Boaz, secretary and treasurer of the Boaz-Kiel Construction Co., and H. E. Billman, president of the Rock Hill Quarries Co.

Patents have recently been obtained for the product, which is obtained by processing slag from blast furnaces. While hot, the slag is filled with air bubbles, which make the aggregate light and give it insulating qualities, Mr. Hunsaker explained last week. The processed material is cooled and crushed into various sizes. The aggregate has been named Cellastone.

The General Aggregate Corporation has contracted to buy slag from the St. Louis Gas and Coke Corp., Hunsaker stated.—*St. Louis* (Mo.) *Globe-Democrat.*

## John Rogers Maxwell

JOHN ROGERS MAXWELL, 58, sportsman and retired business man, died of heart disease at his home in Villanova, Penn., April 12, after an illness of three months.

Mr. Maxwell retired in 1917 as head of the Philadelphia office of the Atlas Portland Cement Co., of which he was a director and his father, the late J. Rogers Maxwell, was the founder. The last few years he had spent traveling and playing golf.

Born in Brooklyn, he was educated at Brooklyn Polytechnic Institute and Amherst College, graduating from the latter in 1897. Interested in golf since his college days, he engaged extensively in amateur play.

He leaves his wife, two sons, two daughters, two brothers and a sister.—*New York* (N. Y.) *Times.*

## Medusa Organizes New Selling Company

MEDUSA Products Co. has been organized as a subsidiary of the Medusa Portland Cement Co., Cleveland, Ohio, and will function as the selling company for Medusa portland cement paint; Medusa floor coating and primer; as well as the entire line of rust-proof coatings and technical paints manufactured by the Studebaker Chemical Co. of Elyria, Ohio, for which it will be exclusive distributors. These products include Rust-Oy, Aluminoy, A.W.A.Paint, and a non-penetrating wall size for fresh plaster.

The executive and general offices of the Medusa Products Co. will be located at 1002 Engineers Bldg., Cleveland, Ohio.

## Proceed with Construction of New Gypsum Plant

RECONSTRUCTION of the plant of the Jumbo Plaster and Cement Co. at Sigurd, Utah, involving an expenditure of nearly $500,000, will start immediately, W. P. Payne, president and general manager, has announced.

Mr. Payne has gone to Sigurd with W. C. Stevenson, a San Francisco construction engineer, where the latter will supervise the building, which will be equipped with the latest machinery for the manufacture of hardwall plaster and white English cement.

Each unit of machinery will be electrically powered.—*Salt Lake* (Utah) *Tribune.*

## Contractors to Furnish Cement for Wisconsin Road Contracts

THE WISCONSIN highway commission has announced that contractors will be required to furnish the cement for highway construction after the present supply which the commission has under order has been exhausted. The state contracted in December for more than 1,000,000 bbl.

## Sand Products Arranges for New York Lake Terminal

THE SAND PRODUCTS CORP., Detroit, Mich., is making arrangements with the Lackawanna railroad for berthing and unloading its floating equipment at Oswego, N. Y., through which port it expects to handle its eastern New York business, the *Oswego* (N. Y.) *Palladium-Times* reports.

The company will use the west side of the trestle terminal, where the Great Lakes Dredge and Dock Co. last year unloaded stone for breakwater construction, and an additional track will be put down on the terminal so that nine cars may be loaded at a time from the self-unloading steamships, which will, however, for the early part of the season, at least, have to come in on a reduced draft to that terminal.

The Lackawanna will let a contract for dredging the west side of the trestle so there will be 16 ft. of water in the loading berth, as this will not necessitate taking out more than loose materials, and will not involve drilling and blasting as would a depth of 21 ft. of water, although with a prospect of continued business it is probable the company will want to make the west side of the terminal available to upper lake shipping, it was said recently.

The Sand Products Corp. has guaranteed a minimum of 30,000 tons of sand for transshipment this season, and this may go much higher but that tonnage has already been ordered by industrial concerns, and if business conditions improve may be tripled. This will be about 10 boat loads under existing conditions of depth of water at the terminal.

## Floyd Million

FLOYD MILLION, 66, pioneer sand and gravel pit operator, died at his home in Lake Cicott, Ind., on March 29. Death followed an illness of 16 months.

Mr. Million was one of the first business men in the sand and gravel business in that section and with his son, Frank, operated the gravel pit at Lake Cicott for nearly 10 years. He recently sold out to the American Aggrgeate Corp., Greenville, Ohio, as announced in the March 12 issue of ROCK PRODUCTS.—*Monticello* (Ind.) *Democrat.*

## Predicts Upturn in Business

BUSINESS is due to pick up the latter part of this year, Blaine S. Smith, president of the Pennsylvania-Dixie Cement Co., said recently when in Chattanooga, Tenn., for the resumption of operations of the Richard City plant.

Mr. Smith added that business sentiment is better over the country than several months ago because of vast road building plans over the country. — *Chattanooga* (Tenn.) *News.*

# Record Breaking Blast at Manistique Quarry

By A. J. Cayia

General Superintendent, Inland Lime and Stone Co.

WHAT IS REPORTED by explosives engineers to be the largest commercial blast on record in the United States, was fired March 16, at the limestone quarry of the Inland Lime and Stone Co., a subsidiary of the Inland Steel Co., about 22 miles east of Manistique, Mich.

The blast resulted in the successful breaking of approximately a year's supply of limestone and proved the engineer's estimates on the economy and effectiveness of a very large shot over an extended area.

A total of 440,966 lb. of explosives was fired. The successful firing of a large shot at this quarry last year when more than 313,000 lb. of explosives was used, focused the attention of the quarry management on the effectiveness of large blasts. Under this system, the drilling can be done during the winter season, utilizing the summer operating organization. This allows practically year around employment for the large majority of our employes where normally they would be employed only during the season of navigation.

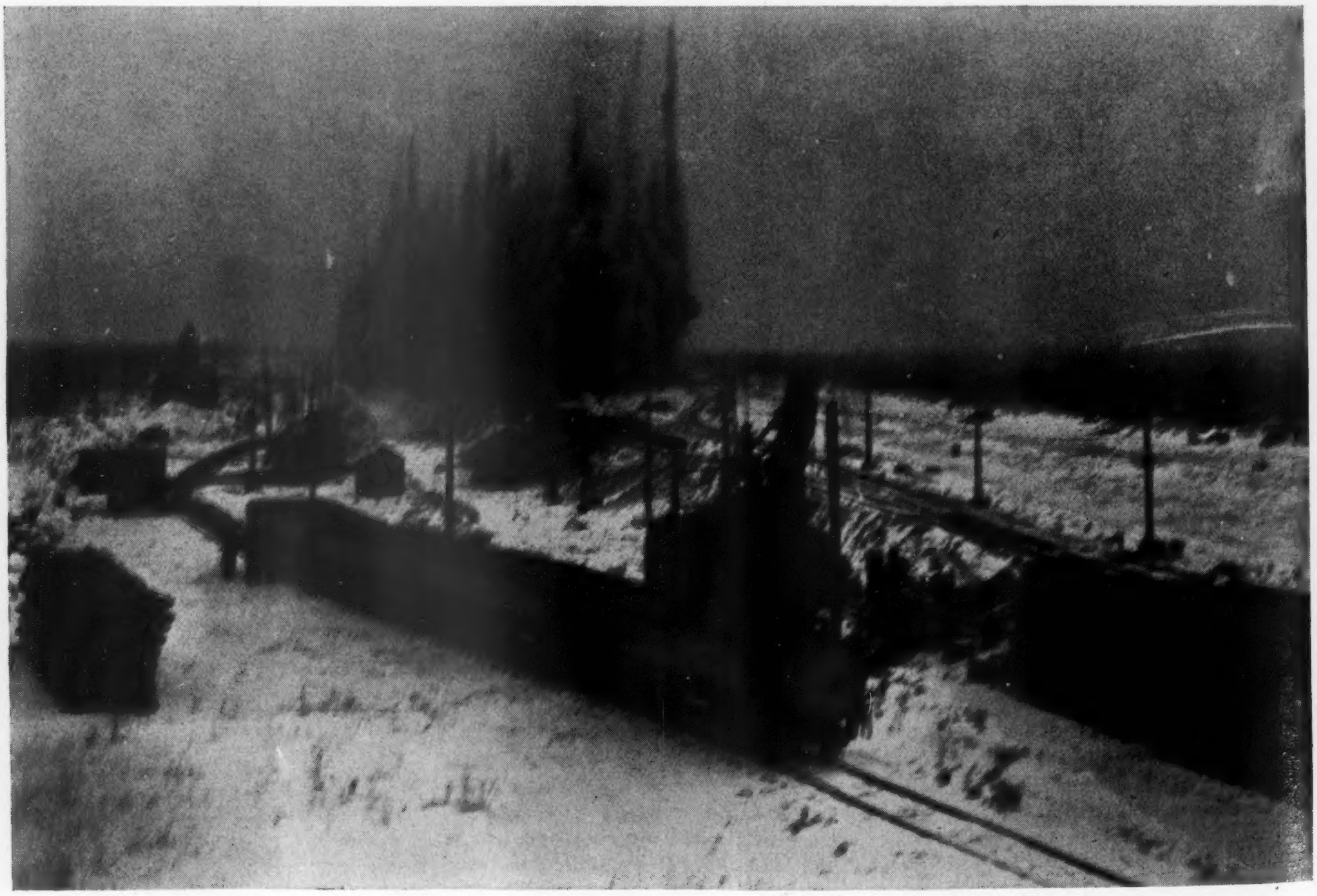
The area drilled covered a space 4400 ft. long by 200 ft. wide. Over four thousand 6-in. holes were drilled by nine blast hole drills over a period of 3½ months. The total footage of this was over 125,000 ft. The large number of holes was made necessary by the fact that three track benches were included in this area and closer spacing and greater over depth drilling was required to obtain proper fragmentation.

A survey by explosives engineers of the Hercules Powder Co. determined the quantites of explosives needed for each hole and a general plan for the blast was formulated in conjunction with the quarry management. An accurate record of the fragmentation obtained in specific areas by the 1931 blast was the basis for determining the loading factor, the selection of the type and strength of explosive, also the location and amount of deck loads.

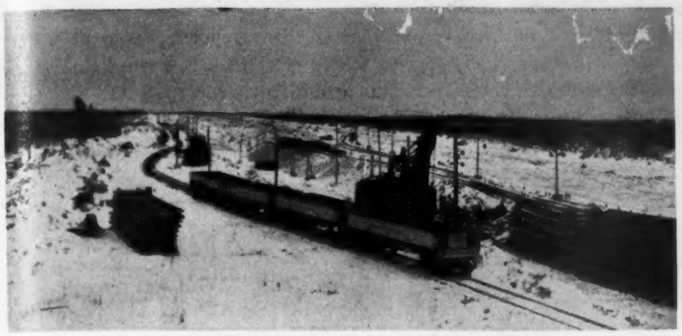
The dynamite used in the blast consisted of 216,916 lb. of Hercules "Gelamite A" in 5x16-in. cartridges, and 224,050 lb. of Hercules 40% "extra L F Gelatin," in 5x16-in. cartridges. Gelamite is a new type explosive economically doing the work of Gelatin in certain types of blasting. In this instance all holes were at least partly filled with water and although some of the powder was in the holes for eight days the surface indications following the blast seemed to indicate complete and successful detonation.

### *Limestone Screenings for Stemming*

Due to the shot being loaded in winter weather and the difficulty experienced with sand stemming last year, it was decided to use minus ½-in. crushed limestone. More than forty carloads of this material was required and the ease of handling and free running qualities considerably reduced the time required to stem the holes, and more than justified its choice.



*View as blast was fired, looking from the end*



General view of quarry before blast

View of loading operations

Distribution of explosives over the area began Sunday, March 6. The actual loading started Tuesday morning, March 8. The bench holes were loaded first and by Thursday night 1300 holes had been loaded and 112,000 lb. of dynamite had been placed in the ground, complete with stemming. By Saturday night, March 12, 2700 holes had been completed with a total of 275,000 lb. of powder in the ground. On Tuesday, March 15, at noon, the complete blast or 4031 holes had been loaded and stemmed.

### Cordeau Detonator Used

Tuesday afternoon was devoted to cleaning the area of empty boxes and stripping the Cordeau at each hole, making ready for connecting the next day. The Cordeau hookup was started at 7:30 on Wednesday morning and 44 workmen completely hooked up the blast in 4½ hours, including the first inspection. The second and final inspection was made between the hours of one and two and the blast was fired at 3:02 p. m.

The loading operation was thoroughly organized to the end that the charges be accurately placed as to quantity and at proper depth. Previous to starting the loading, all holes were sounded and from tables previously prepared the charge for each hole was determined according to depth and spacing. This charge in terms of number of sticks of each kind of dynamite was written on a linen tag and placed at the hole. The depth of the hole was also marked on the tag as was also an identifying letter corresponding to the nine arbitrary sections into which the quarry had been divided. When the loading of a hole was completed this tag was turned in to the office. Its letter identified the section and was used daily to keep an account of the progress of the loading and also to check the total dynamite loaded in a section against the theoretical loading computed.

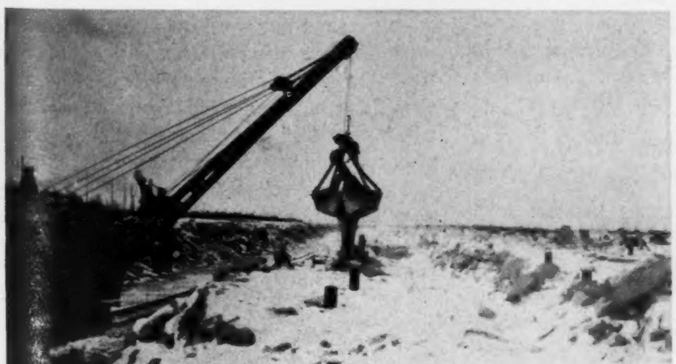
### Right Charge for Each Hole

After the sounding of the holes was completed the dynamite was distributed to each hole in the quantities called for on the tag. Stemming was also distributed over the area in sufficient quantities to insure the stemming being completed immediately after the charge was loaded.

The men engaged in the preparation and loading were given a printed card containing general and specific rules for safety in this work. Also detail instructions for the placing of the powder and Cordeau. On the reverse side SAFETY FIRST was printed in large red type.

When all preliminaries were completed several loading crews were started. Their routine was: First sound the hole to be loaded and if the depth did not coincide with the depth on the tag, mark the hole, report it to the foreman and move to the next one.

View after blast, showing fragmentation



Distributing limestone screenings for stemming holes

Loading crews at work

If the depth checked the Cordeau was laced through the first stick and lowered into the hole. The wooden tamping pole was then inserted to determine if the first stick reached the bottom. If it did not the foreman was called and took the necessary approved methods to get it to the proper depth before any more dynamite was added. After the first stick was properly placed the balance of the dynamite was dropped a stick at a time and rammed home with the wooden pole, and held in place until the charge had been stemmed with approximately 3 ft. of fine rock stemming to prevent the charge from being displaced by water pressure or any other cause. The loading crew then proceeded to the next hole. A stemming crew followed closely and completed the stemming.

Any holes not to proper depth were reentered by a drill kept on the blast area for that purpose, and cleaned out. A special crew of loaders then loaded these odd holes.

#### *Used 38 Miles of Cordeau*

The Cordeau used in each hole and in connecting all holes required 143,563 ft. of double countered and 55,710 ft. of plain, a total of 199,273 ft. or about 38 miles.

The shot was worthy of comment from a safety standpoint in the fact that there was not a single lost-time accident among the seventy odd employes of the Inland Lime and Stone Co. and the several Hercules explosives engineers during the unloading of the powder, its distribution, and loading of the holes. This perfect safety record was particularly commendable by reason of the fact that the worst weather of any time in the winter in the shape of high winds and biting cold was experienced during the nine days in which the shot was being loaded and connected. Among all the employes assisting in the loading, there was no report of a powder headache.

#### *Witnessed and Recorded by Movies and Experts*

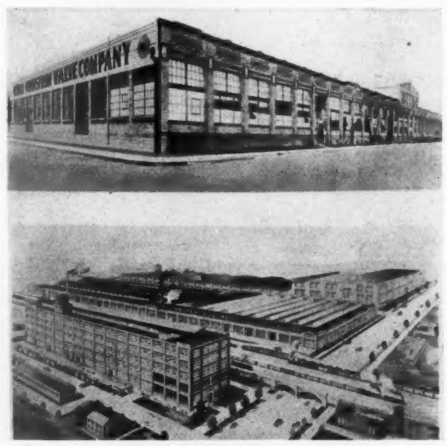
Because of the size of the blast, it incurred wide popular interest and representatives of three news reel companies were at the quarry securing sound pictures. The United States Bureau of Mines was represented, as was the United States Coast and Geodetic Survey. While the shock from the explosion was scarcely noticeable at any distance immediately removed from the quarry, earth tremors naturally occurred, which could be picked up by geophysical apparatus. In order to aid seismological stations in measuring the vibrations through the underground structure, the exact time of the explosion was noted, using time signals by radio from Washington. Seismographic records of the earth tremors were obtained at Buffalo, N. Y., Madison, Wis., East Lansing, Mich., and at Georgetown University, Washington, D. C., the latter about 1500 miles air line from Manistique, Mich.

Various officials of the Inland Lime and Stone Co. and its parent company, the Inland Steel Co. of Chicago, witnessed the blast. W. J. Keese and C. D. Peacock were the Hercules explosives engineers on the job, and the author, as general superintendent of the Inland Lime and Stone Co., had charge of the operations.

## Acquires Merco Nordstrom Valve Co.

ANNOUNCEMENT is made of the consolidation of the Pittsburgh Equitable Meter Co. and the Merco Nordstrom Valve Co. Arrangements have been completed for the Pittsburgh company to acquire all the capital stock of the Merco Nordstrom Valve Co. and the latter will operate as a division of the Pittsburgh Equitable Meter Co.

The Pittsburgh concern was founded by the late George Westinghouse. The valve company was founded by S. J. Nordstrom, who invented the "Sealdport" type of lubricated plug valve.



***Oakland, Calif., plant of Merco Nordstrom Valve Co., above; Pittsburgh plant of Pittsburgh Equitable Meter Co., below***

W. F. Rockwell of the Pittsburgh company becomes president of the Merco company. Warehouse stocks for both companies are to be carried in Los Angeles, Kansas City, Chicago, Columbia (S. C.), and certain other points. Sales offices of each company will be available to the other, according to W. F. Rockwell. It is the intention of the enlarged organization to add new products and accessories to the present line of valves, meters and regulators.

## To Start Soon on $750,000 Products Plant

JOHN D. GREGG expects to start work on the $750,000 cement products plant on the north side of the valley near Van Nuys, Calif., which will take months of construction and when completed will employ about 275 men. Mr. Gregg is a man of independent means, and one reason he is starting this huge plant is that he plans to make his fortune serve the public good in a beneficial way at this critical time in depression, the *Van Nuys Tribune* reports.

The whole project has been held up by previous inability to secure a railroad connection, and 20 carloads of machinery are ready to go to work as soon as they can be placed on the property.

## Committee Will Aid Home Owners

THE COMMITTEE on reconditioning, remodeling, and modernizing, organized to help carry out the recommendations of the President's conference on home building and home ownership, has been reorganized as a continuing group. It comprises an impartial body of representative persons from the technical, architectural, financial, social welfare, and commercial fields of business.

It is the purpose of this committee to assist home owners, local organizations, and others interested in home improvements, through educational work emphasizing benefits resultant from constructive plans for reconditioning, remodeling, and modernizing. The committee particularly hopes to be able to furnish information which will assist home owners of limited resources to make their homes more comfortable at relatively small expense. The committee also hopes to offer advice and cooperation in securing best results when using the various general classifications of building materials.

## Standard Contract Form for Aggregates Saves Trouble

L. J. BOESTER, of T. L. Herbert and Sons, sand and gravel producers and building supply dealers, Nashville, Tenn., has devised and is using a standard contract form which producers elsewhere could well imitate. Such a specific written contract on all important jobs should help prevent the pernicious tendency of sniping at contracts already made by price-cutting, Mr. Boester states:

"We use this form of contract on all sales of sand and gravel made on state highway projects.

"It is our understanding that some of the other producers in this section are using either a similar contract or one embodying the fundamental conditions of the one that we are using, but we do not think the stone producers are using this exact form of contract; however, it is our understanding that they have a very good form of contract which they also are using on state highway projects. We use our contract only on paving jobs and do not use it on the small structures involved in grading and drainage work. We do not use this form of contract on ordinary building construction, inasmuch as a lot of our orders are received over the telephone; and we have never had any particular trouble on this kind of business, although it is true that occasionally some competitor will continue to work on an order after it has been placed."

ORIGINAL

# Aggregate Contract

THIS AGREEMENT OF SALE made this.................................day of.................................................., 19.......

Between T. L. HERBERT & SONS (SELLERS), of Nashville, Tenn., and.................................................................

.......................................................................................(BUYER), of.................................................................

WITNESSETH:

1. **For and in Consideration** of the price named and subject to the terms and conditions herein specified, SELLER hereby sells and agrees to furnish and deliver, and BUYER hereby buys and agrees to receive and pay for.................................. for use in the work specified, to be shipped between the date hereof and the..................day of.........................................., 19.......

2. The material to be furnished under this contract, when tested by the methods recommended by the American Society for Testing Materials, shall conform to the specifications of:
(1) The engineer or architect supervising the work described; or,
(2) The standard specifications adopted by the American Society for testing materials; or,
(3) The standard specifications adopted by the American Concrete Institute.
whichever of the three above methods, the BUYER, at the time of executing this contract, may select by striking out the other two; but if the BUYER makes no selection at the time of executing the contract, then by whichever of the three above methods the SELLER may select. In no event, however, does the SELLER assume any responsibility for the improper use of the material nor does the SELLER guarantee the finished work.

3. **Price:** $..............................per ton of 2,000 pounds F.O.B. cars SELLER'S plant, freight, if and when but not until actually paid by the BUYER, allowed to destinations named in Paragraph (5) and unless the SELLER agrees by endorsement hereon to prepay the freight, all freight shall be paid by the BUYER and allowed by the SELLER on presentation of receipted bills. When by endorsement hereon, freight is to be prepaid by the SELLER, it shall be repaid by the BUYER immediately upon receipt of statement therefor and all such repayments of prepaid freight shall be credited on the purchase price. Prices quoted are based on freight rates now in effect and are subject to revision if freight rates are changed.

4. **Terms:**

5. **Description of Work and Destinations, viz:**

6. **Quantity:** All the material herein specified, which is required in the above work, estimated at.............................. short tons; but SELLER is not obligated to deliver more than the quantity actually used in said work during the delivery period specified in paragraph one hereof, nor more than..............................short tons during any thirty day period. BUYER shall give SELLER shipping instructions in writing at a reasonable time before shipments are to be made.

7. Unless otherwise specified, SELLER reserves the right to prescribe the route by which shipments shall be forwarded. SELLER'S responsibility ceases when shipments are delivered to the railroad company on cars at SELLER'S plant and SELLER will not thereafter be responsible for shortage or damage. Railroad track scale weights taken at point of origin shall be conclusive as to the quantity shipped and shall govern all settlements. In the absence of railroad track scales at point of origin, the first weights obtained by the railroad companies enroute shall be conclusive as to quantity shipped and shall govern all settlements. All railroad demurrage, car service and terminal charges at destination shall be settled for and borne by BUYER.

8. Any claim made by the BUYER against the SELLER on account of any shipment of the material sold under this contract shall be made in writing in ten days after the BUYER receives the shipment, otherwise, any such claim is waived.

9. Deliveries are subject to contingencies of production and shipping and other causes beyond SELLER'S control; and SELLER will not be responsible for car shortages, delay in transit, strikes, break downs, high water, Acts of God, or any contingencies beyond the control of the SELLER nor for any delays caused thereby.

10. Should the BUYER fail to make his payments in accordance with this contract, or should the BUYER'S credit, in the opinion of the SELLER, become impaired or unsatisfactory, SELLER reserves the right to require payments in advance, or, at SELLER'S option, may decline to make further deliveries, the BUYER remaining liable for all unpaid accounts; and in the event BUYER fails to make payment for material in accordance herewith, the BUYER agrees to assign, and does hereby assign, a sufficient sum out of his next estimate (and if his final estimate has been paid, then out of any retainage) due or to become due the BUYER from the State, Municipal, County or other Public Authority or owner, letting the contract to the BUYER on which the materials have been used.

11. This contract contains the entire agreement between the parties and it is expressly stipulated that there are no oral agreements, understandings or representations made by or with any salesman or otherwise except as are herein expressly stipulated. This contract is subject to the approval of an Executive Official of the SELLER and is not binding on the SELLER until so approved. This contract shall be binding upon the heirs, executors, administrators, successors or assigns of the respective parties but shall not be assigned by BUYER without the written consent of SELLER.

..........................................................................................................................................

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..........................................................................................................................................

Executed in triplicate on the date first above written at..........................................................................

T. L. HERBERT & SONS

By.......................................................................
(Salesman)
(SELLER)

APPROVED:

..........................................................................
(Executive Officer of SELLER)

..........................................................................

By.......................................................................
(BUYER)

# Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

# California Products Manufacturer Uses Pumice as Aggregate

By W. A. Scott*

THE UTILIZATION of pebble pumice and pumicite in combination with cement for the production of hollow concrete building tile has developed into an interesting and important branch of the Jourdan Concrete Pipe Co.'s business at Fresno, Calif. These new structural units, bearing the trade name of Pumitile, are made on a Flam vibrating machine, the mixer batch for this purpose consisting of 1 sack of cement, 6 cu. ft. of pebble pumice and 20 lb. of pumicite, plus sufficient water for a very wet mix. No other mineral aggregates are used in the mixture.

Concrete of this composition weighs 80 to 90 lb. per cu. ft., as compared with about 150 lb. for ordinary cement concrete. Pumitile units, thus constituted, besides being of light weight, have the requisite compression strength, low water absorption, low conductivity of heat and are of pleasing appearance. Then Pumitile concrete is adaptable to making admixtures of mineral pigments for producing tile of various tints and colors. Tile of this consistency, not being fragile, may be cut, trimmed, sawed or nailed. The surfaces afford a natural base for applying a stucco or plaster finish, or paint, without any special binder or other material to provide bond.

Pumitile units of the standard sizes, produced on the Flam machine, are discharged to the pallets, three of 8-in., four of 6-in., or six of 4-in., being molded at each operation of the machine. These are cured in the yards, as are the ordinary concrete building tile.

Attention is called to compression tests made at the Twining laboratories of Fresno, showing a strength of 1100 lb. in 14 days, 1350 lb. in 28 days and 1700 lb. in 4 months. It is stated also that Pumitile units have withstood fire tests up to 2000 deg. F.

*Artistic living room with painted Pumitile walls*

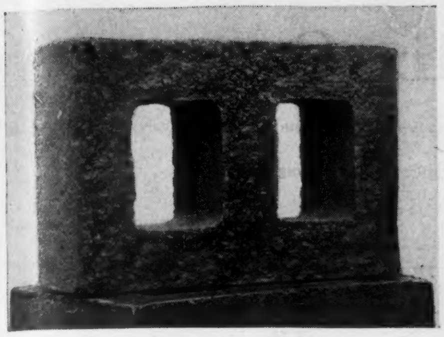
### *Description of Deposits of Pumice and Pumicite*

The pumice and pumicite used in making up the mixer batches for Pumitile concrete are taken from deposits situated on the south side of the San Joaquin river, in the vicinity of Friant, and about 18 mi. northeasterly from Fresno. An estimate of the amount of material in the deposits places it at 20,000,000 tons.

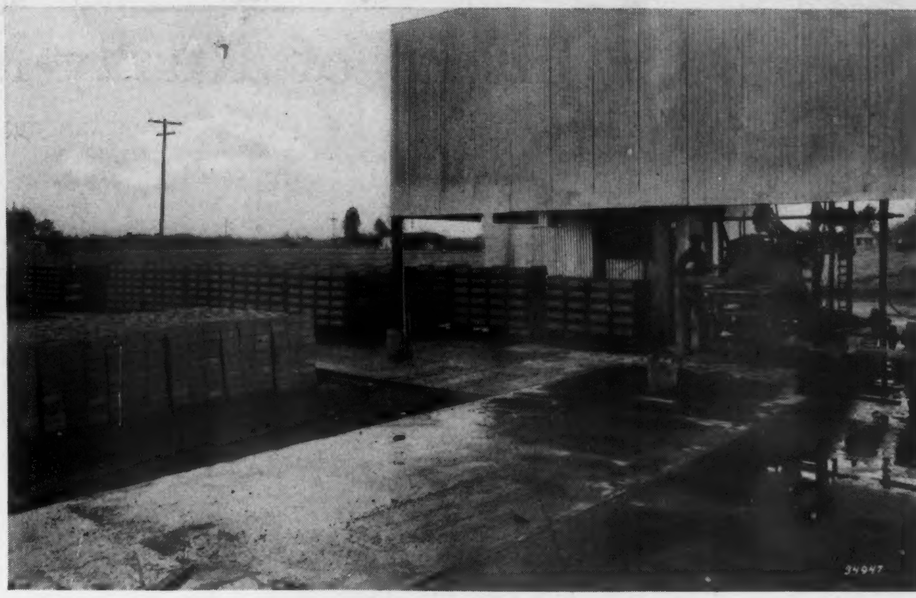
The two classes of material, pumice and pumicite, have been deposited in alternate strata in hills that have been raised from an ancient lake bed, and are of volcanic origin. Pumice has a cellular structure and is classed by some authors as a rhyolitic lava. It weighs about 50 lb. per cu. ft., and, as shown by analysis, carries 90.84% silica, 4% iron and alumina, 0.021% magnesia, 0.079% potash, a trace of lime and 4.16% of water and undetermined elements. It comes from the mine in the form of pebble pumice, running from the maximum size of ¾-in. down to the fineness of cement.

Pumicite is chemically similar to pumice, but structurally different. As it occurs in the deposit, pumicite is 50% finer than cement, being composed of minute, sharp particles of volcanic ash. When used as a co-mix

*For the data used herein the writer is indebted to H. W. Chutter, manager of the Jourdan Concrete Pipe. Co.



*A Pumitile unit*



*Plant for manufacturing light weight units*

with the usual aggregate it results in a denser and smoother concrete from which the forms are more readily stripped.

Mining operations, as at present conducted, are centered at a prominent mound in which drifts and excavations are extended horizontally and vertically, whereby the material from the alternate layers may be taken out

*Mr. Chutter's home of Pumitile*

separately. The mine plant is equipped for classifying and sacking the different grades required, the graded material being transported by auto trucks to the company's Pumitile manufacturing plant, situated on Golden State highway, on the outskirts of Fresno. A crew of 10 men is employed at mine and factory.

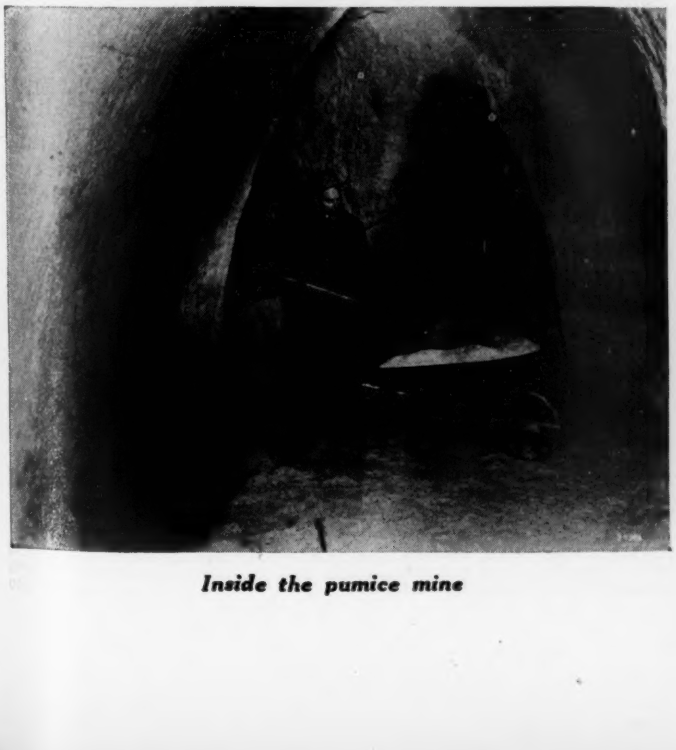
The Jourdan Concrete Pipe Co. has been producing Pumitile units for the last nine months, during which time several thousands of them have been supplied to the San Joaquin Light and Power Corp. Numerous small structures in Fresno and neighboring towns have been built of Pumitile, including a Japanese school house at Fowler.

### *Used for Residence Construction*

The outstanding example of Pumitile construction is that of the attractive 7-room residence of H. W. Chutter in Fresno, recently completed. Spanish architecture was employed. The tile were untreated on the exterior, but were set off with an old-rose mortar joint, presenting the appearance of the old whitewashed adobe houses built by the Spanish fathers. The interior of the large living room was given a light coat of paint, directly upon the tile, showing their outlines. The other interior walls were plastered directly on the Pumitile. Eight-inch units were used in the exterior walls and 6-in. in the partition walls. The ceilings are of ¾-in. Insulite, with 2-in. of graded pumice on same between the rafters, which is one method of roof insulation recommended by the U. S. Bureau of Standards.

It is noted that pebble pumice has been used extensively in Europe for building construction, considerable of which is now exported from Germany to England for the same purpose. The Neuwied district of the middle Rhine region is the center of the German pumice industry.

ROCK PRODUCTS, November 21, 1931, pubished a vauable article on the pumice deposits of the United States and their possibilities.



*Inside the pumice mine*

*Where pumice and pumicite are prepared*

# Current Prices of Ready-Mix Concrete

**AMARILLO, TEX.**—Prices per cu. yd.*

Lime Mortar

| Mix | |
|---|---|
| 1-4 | 6.50 |
| 1-4½ | 6.25 |
| 1-5 | 6.00 |

Terrazzo

| Mix | |
|---|---|
| 1-3 -0 | 9.00 |
| 1-3½-0 | 8.50 |
| 1-4 -0 | 8.00 |
| 1-4½-0 | 7.75 |
| 1-5 -0 | 7.50 |

Topping

| Mix | |
|---|---|
| 1-1 -0 | 13.75 |
| 1-1½-0 | 12.75 |
| 1-2 -0 | 11.75 |
| 1-2½-0 | 11.25 |
| 1-3 -0 | 10.75 |
| 1-3½-0 | 10.25 |

Base—Strength

| | |
|---|---|
| 4000 lb. per sq. in. | 9.50 |
| 3500 lb. per sq. in. | 9.00 |
| 3000 lb. per sq. in. | 8.75 |
| 2500 lb. per sq. in. | 8.50 |
| 2000 lb. per sq. in. | 8.25 |
| 1500 lb. per sq. in. | 8.00 |

Base

| Mix | | Mix | |
|---|---|---|---|
| 1-2 -3½ | 9.25 | 1-3 -5 | 8.00 |
| 1-2¾-4 | 9.00 | 1-4 -6 | 7.25 |
| 1-3½-4½ | 8.00 | | |

*For orders of 50 cu. yd. or more, prices are 75c less per cu. yd. than quoted. Free delivery within city limits for 1 cu. yd. or more per load; $1.00 per load extra for less than 1 cu. yd. loads, except to finish a job. Additional charge of 10c per mile per cu. yd. for deliveries outside of city limits.

**BELLINGHAM, WASH.**—Prices per cu. yd.¶

| Mix | Retail, f.o.b. bunkers | In carloads | Mix | Retail, f.o.b. bunkers | In carloads |
|---|---|---|---|---|---|
| 1-3-4 | 6.85 | 6.10 | 1-2-3 | 7.85 | 6.91 |
| 1-3-5 | 6.51 | 5.75 | 1-2-4 | 7.27 | 6.50 |

¶Additional charges for delivery to various zones. First zone, added charge of 75c per cu. yd.; second zone, added charge of $1.05; third zone, added charge of $1.40; fourth zone, added charge of $1.75.

**BOSTON AND CAMBRIDGE, MASS.**—Price per cu. yd. for orders of 30 cu. yd. and over.‡

| Mix | | Mix | |
|---|---|---|---|
| 1-2 -4 | 7.25 | 1-1½-3 | 7.80 |
| 1-3 -6 | 6.75 | 1-1 -2 | 8.55 |
| 1-2½-5 | 7.00 | 1-2 | 10.25 |
| 1-2 -3 | 7.70 | | |

‡Discount of 50c per cu. yd. allowed on deliveries made between the 1st and 15th of the month if bill is paid on or before the 25th and on deliveries made between 15th and 30th if paid on or before the 10th of following month.

**CHAMPAIGN, ILL.**†—Prices per ton (weight, 4000 lb. per cu. yd.)

| Mix | | Mix | |
|---|---|---|---|
| 1-2-3 | 5.25 | 1-2-4 | 4.75 |
| 1-3-5 | 4.50 | | |

† 5% trade discount to contractors. Prices to both contractor and consumer subject to cash discount of 5% for payment by 10th of month following del. For quick strength concrete, 1-2-3 mix, extra charge of $1.50 per ton; 1-2-4 mix, $1 per ton extra. Added charge of 25c per ton for the use of chloride, lime or Celite in any wet mix. For heating concrete, 12½c extra per ton. For topping, any mix, $1.35 for each sack of cement used.

**COLUMBUS, OHIO**—Delivered prices per cu. yd.

| | Zones§ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mix | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1-1½-3 | 6.05 | 6.20 | 6.35 | 6.50 | 6.65 | 6.80 | 6.95 | 7.10 | 7.25 | 7.40 |
| 1-2 -3 | 5.80 | 5.95 | 6.10 | 6.25 | 6.40 | 6.55 | 6.70 | 6.85 | 7.00 | 7.15 |
| 1-2 -3½ | 5.60 | 5.75 | 5.90 | 6.05 | 6.20 | 6.35 | 6.50 | 6.65 | 6.80 | 6.95 |
| 1-2 -4 | 5.40 | 5.55 | 5.70 | 5.85 | 6.00 | 6.15 | 6.30 | 6.45 | 6.60 | 6.75 |
| 1-2½-4 | 5.25 | 5.40 | 5.55 | 5.70 | 5.85 | 6.00 | 6.15 | 6.30 | 6.45 | 6.60 |
| 1-3 -4 | 5.15 | 5.30 | 5.45 | 5.60 | 5.75 | 5.90 | 6.05 | 6.20 | 6.35 | 6.50 |
| 1-2½-5 | 5.00 | 5.15 | 5.30 | 5.45 | 5.60 | 5.75 | 5.90 | 6.05 | 6.20 | 6.35 |
| 1-3 -5 | 4.90 | 5.05 | 5.20 | 5.35 | 5.50 | 5.65 | 5.80 | 5.95 | 6.10 | 6.25 |
| 1-3 -6 | 4.75 | 4.90 | 5.05 | 5.20 | 5.35 | 5.50 | 5.65 | 5.80 | 5.95 | 6.10 |
| 1-4 -8 | 4.50 | 4.65 | 4.80 | 4.95 | 5.10 | 5.25 | 5.40 | 5.55 | 5.70 | 5.85 |
| 1-2 | 7.45 | 7.60 | 7.75 | 7.90 | 8.05 | 8.20 | 8.35 | 8.50 | 8.65 | 8.80 |
| 1-3 | 6.60 | 6.75 | 6.90 | 7.05 | 7.20 | 7.35 | 7.50 | 7.65 | 7.80 | 7.95 |

§All zones radiating from center of city. Zone 1 is one mile in radius, zone 2 is two miles in radius, zone 3 is three miles in radius, etc. Cash discount: 25c per cu. yd. 10th of month following date of delivery. Orders for less than 2 cu. yd. will carry same haul charge as 2 cu. yd. Orders for 2 cu. yd. or over will be delivered in full loads at 2 yd. or more. No extra charge will be made for finishing load if less than 2 cu. yd. Fifteen minutes allowed to unload. Additional time charged at rate of $2.00 per hour. All prices subject to revision to conform to current costs of materials.

**DALLAS, TEX.**†

| | Slump | | | | Slump | | |
|---|---|---|---|---|---|---|---|
| Strength | ½ in. to 1 in. | 3 in. to 4 in. | 6 in. to 7 in. | Strength | ½ in. to 1 in. | 3 in. to 4 in. | 6 in. to 7 in. |
| 1500 | 5.25 | 5.45 | 5.75 | 2500 | 5.80 | 6.00 | 6.30 |
| 2000 | 5.55 | 5.75 | 6.05 | 3000 | 6.15 | 6.45 | 6.75 |

Fixed Mixes (any slump)

| | | | | | |
|---|---|---|---|---|---|
| 1-2½-5 | 6.45 | 1-2-4 | 6.75 | 1-1½-3 | 7.45 |

†Prices subject to 2% 15 days and are based on quantities of 50 to 999 cu. yd. and on delivery in 2½-cu. yd. loads within Zone 1, which extends about 1½ miles from either of two plants. Zone charges are approximately 10c per cu. yd. per mile beyond the Zone 1 limit. On quantities under 50 cu. yd. add 20c and on quantities over 1000 cu. yd. deduct 30c.

**CLEVELAND, OHIO** (a)—Prices per cu. yd. to contractors for orders of 2 cu. yd. or more.

Public Square basing point
Aggregate: Limestone

| Mix | | 1st mile | 2nd mile | 3d mile (Maximum) |
|---|---|---|---|---|
| 1-1 -2 | | 7.50 | 7.75 | 8.00 |
| 1-2 -3 | | 6.30 | 6.55 | 6.80 |
| 1-2 -4 | | 6.00 | 6.25 | 6.50 |
| 1-2½-3½ | | 6.00 | 6.25 | 6.50 |
| 1-2½-4 | | 5.80 | 6.05 | 6.30 |
| 1-3 -4 | | 5.70 | 5.95 | 6.20 |
| 1-2½-5 | | 5.60 | 5.85 | 6.10 |
| 1-3 -5 | | 5.50 | 5.75 | 6.00 |
| 1-3 -6 | | 5.40 | 5.65 | 5.90 |
| 1-4 -8 | | 5.25 | 5.50 | 5.75 |
| 1-2 | Finish | 7.50 | 7.75 | 8.00 |
| 1-2½ | Finish | 7.00 | 7.25 | 7.50 |
| 1-3 | Finish | 6.50 | 6.75 | 7.00 |

Basing point: Windfall Road and Broadway, Bedford, Ohio
Aggregate: Bedford gravel

| | Miles | | | | | | |
|---|---|---|---|---|---|---|---|
| Mix | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th* |
| 1-1 -2 | 6.50 | 6.75 | 7.00 | 7.25 | 7.50 | 7.75 | 8.00 |
| 1-2 -3 | 5.30 | 5.55 | 5.80 | 6.05 | 6.30 | 6.55 | 6.80 |
| 1-2 -4 | 5.00 | 5.25 | 5.50 | 5.75 | 6.00 | 6.25 | 6.50 |
| 1-2½-3½ | 5.00 | 5.25 | 5.50 | 5.75 | 6.00 | 6.25 | 6.50 |
| 1-2½-4 | 4.80 | 5.05 | 5.30 | 5.55 | 5.80 | 6.05 | 6.30 |
| 1-3 -4 | 4.70 | 4.95 | 5.20 | 5.45 | 5.70 | 5.95 | 6.20 |
| 1-2½-5 | 4.60 | 4.85 | 5.10 | 5.35 | 5.60 | 5.85 | 6.10 |
| 1-3 -5 | 4.50 | 4.75 | 5.00 | 5.25 | 5.50 | 5.75 | 6.00 |
| 1-3 -6 | 4.40 | 4.65 | 4.90 | 5.15 | 5.40 | 5.65 | 5.90 |
| 1-4 -8 | 4.25 | 4.50 | 4.75 | 5.00 | 5.25 | 5.50 | 5.75 |
| 1-2 Finish | 7.00 | 7.25 | 7.50 | 7.75 | 8.00* | ...... | ...... |
| 1-2½ Finish | 6.50 | 6.75 | 7.00 | 7.25 | 7.50* | ...... | ...... |
| 1-3 Finish | 6.00 | 6.25 | 6.50 | 6.75 | 7.00* | ...... | ...... |

*Maximum.

(a) Industrials or consumers 50c more than contractors. Extra charge for concrete delivered nights, Sundays or holidays, $1.00 per cu. yd. over daytime schedule. For high-early-strength or waterproofing cements additional charge of $2.00 per cu. yd. For waterproof concrete using Anti-Hydro with manufacturer's guarantee, additional charge of $2.00 per cu. yd. For orders less than 2 cu. yd. add $1.00 per yd. to above prices. Prices quoted are based upon normal discharge of load within 20 minutes after arrival of truck. A demurrage charge of $1.00 for each 15 minutes thereafter.

**DES MOINES, IOWA**—Prices per cu. yd. (b)

(Made with ¾-in. gravel for structural work)

| | | | Zone | | | |
|---|---|---|---|---|---|---|
| Mix | Slump | Plant price | A | B | C | D |
| 1-2½-5 | 2-in. | 6.00 | 6.50 | 6.75 | 7.00 | 7.25 |
| 1-2½-5 | 6 in. | 6.25 | 6.75 | 7.00 | 7.25 | 7.50 |
| 1-2 -4 | 2 in. | 6.50 | 7.00 | 7.25 | 7.50 | 7.75 |
| 1-2 -4 | 6 in. | 6.75 | 7.25 | 7.50 | 7.75 | 8.00 |
| 1-2 -3½ | 2 in. | 7.00 | 7.50 | 7.75 | 8.00 | 8.25 |
| 1-2 -3½ | 6 in. | 7.25 | 7.75 | 8.00 | 8.25 | 8.50 |
| 1-2½-3 | 2 in. | 7.50 | 8.00 | 8.25 | 8.50 | 8.75 |
| 1-2½-3 | 6 in. | 7.75 | 8.25 | 8.50 | 8.75 | 9.00 |

(Made with pea gravel for cellar and sidewalks)

| | | | Zone | | | |
|---|---|---|---|---|---|---|
| Mix | Slump | Plant price | A | B | C | D |
| 1-2½-5 | 2 in. | 5.75 | 6.25 | 6.50 | 6.75 | 7.00 |
| 1-2½-5 | 6 in. | 6.00 | 6.50 | 6.75 | 7.00 | 7.25 |
| 1-2 -4 | 2 in. | 6.25 | 6.75 | 7.00 | 7.25 | 7.50 |
| 1-2 -4 | 6 in. | 6.50 | 7.00 | 7.25 | 7.50 | 7.75 |
| 1-2 -3½ | 2 in. | 6.75 | 7.25 | 7.50 | 7.75 | 8.00 |
| 1-2 -3½ | 6 in. | 7.00 | 7.50 | 7.75 | 8.00 | 8.25 |
| 1-2½-3 | 2 in. | 7.25 | 7.75 | 8.00 | 8.25 | 8.50 |
| 1-2½-3 | 6 in. | 7.50 | 8.00 | 8.25 | 8.50 | 8.75 |

(b) Discount of 50c per cu. yd. allowed on deliveries made between the 1st and 15th of the month if bill is paid before the 25th and on deliveries made between 16th and 30th if paid before the 10th of following month. Quick setting $2.00 per cu. yd. extra; waterproofing, $2.00 per cu. yd. extra. Each zone approximately one mile.

**FAIRMONT, W. VA.**—Prices per cu. yd. (c)

| Mix | Quantity | Delivered | Called for |
|---|---|---|---|
| 1-2-4 | Less than 1 cu. yd. | 11.00 | 10.00 |
| 1-2-4 | From 1 to 4 cu. yd. | 10.00 | 9.00 |
| 1-2-4 | From 5 to 10 cu. yd. | 9.50 | 8.50 |
| 1-2-4 | From 11 to 49 cu. yd. | 9.00 | 8.00 |
| 1-2-4 | From 50 cu. yd. and up | 8.50 | 7.50 |

(c) For 1-2-3 mix add 50c per cu. yd. to prices quoted; for 1-3-5 mix deduct 50c per cu. yd. from prices quoted.

**INDIANAPOLIS, IND.**—Prices per cu. yd. in small quantities, for delivery within 3-mile haul.

| Mix | |
|---|---|
| 1 bbl. cement/cu. yd. concrete | 5.50 |
| 1¼ bbl. cement/cu. yd. concrete | 6.00 |
| 1½ bbl. cement/cu. yd. concrete | 6.50 |

**LOS ANGELES, CALIF.**¶—Prices per cu. yd.

| Mix | 1–5 yd. | 5–25 yd. | 25 or more | Mix | 1–5 yd. | 5–25 yd. | 25 or more |
|---|---|---|---|---|---|---|---|
| 3–50–50 | 8.25 | 7.25 | 6.25 | 1–2¾–3½ | 10.00 | 9.00 | 8.00 |
| 4–50–50 | 8.85 | 7.85 | 6.85 | 1–2 –4 | 9.85 | 8.8[illegible] | [illegible] |
| 1–3 –6 | 8.95 | 7.95 | 6.95 | 1–2½–3½ | 10.10 | 9.10 | 8.10 |
| 1–3 –5 | 8.95 | 7.95 | 6.95 | 1–2½–3¼ | 10.05 | 9.05 | 8.05 |
| 1–2½–5 | 9.50 | 8.50 | 7.50 | 1–2 –3 | 10.60 | 9.60 | 8.60 |
| 1–3 –4 | 9.75 | 8.75 | 7.75 | 1–2 –3½ | 10.20 | 9.20 | 8.20 |

¶Above prices for deliveries in Zone 1 (1-5 miles). Added charge of 75c per cu. yd. for deliveries in Zone 2 (5 to 10 miles). Added charge of $1.50 for Zone 3 (10 to 15 miles). Discount of 50c per cu. yd. if payment is made within 10 days from delivery.

**MEMPHIS, TENN.**—Prices per cu. yd. delivered in city.†

| Strength | Portland | "Incor" | Strength | Portland | "Incor" |
|---|---|---|---|---|---|
| 1800 lb. | 6.50 | 7.30 | 3000 lb. | 8.00 | 9.25 |
| 2000 lb. | 7.00 | 8.00 | 3500 lb. | 8.60 | 10.00 |
| 2500 lb. | 7.50 | 8.50 | 4000 lb. | 9.80 | 11.75 |

†Above prices based on gravel for aggregate. If stone is wanted for aggregate, additional charge of $1.00 per cu. yd. is made to above prices. 5% cash discount for payment 10th of month following date of invoice.

**MILWAUKEE, WIS.**—Prices per cu. yd. (e)

| 28-day breaking strength: | Per sq. in. | Slump 2 to 4 in. | 4 to 6 in. | 6 to 8 in. |
|---|---|---|---|---|
| Garage footings and walls | 2000 lb. | 4.50 | 4.75 | 5.00 |
| Footings, floors, walls | 3000 lb. | 5.50 | 5.75 | 6.00 |
| City paving | 3300 lb. | 4.75 | ...... | ...... |
| Sidewalks, curbs | 4000 lb. | 5.75 | 6.00 | 6.25 |
| 24-hour high early strength | 5000 lb. | 7.00 | 7.50 | 8.00 |

Sold on old mixture method, 2- to 4-in. slump; 4- to 6-in. slump; 6- to 8-in. slump.

| | Mix | |
|---|---|---|
| Walls—Garage footing | 1–3–5 | 4.50 |
| City paving | 1–2–4 | 4.75 |
| Garage floors, walls | 1–3–3 | 5.50 |
| Sidewalk | 1–2–3 | 5.75 |
| Special strength (machine bases) | 1–1½–2½ | 7.00 |
| Facing | 1–3 | 8.00 |
| Facing | 1–2 | 10.00 |

(e) Discount of 25c per cu. yd. if paid by 10th of following month.

**MONTGOMERY, ALA.**—Prices per cu. yd. delivered in city limits. (g)

| Mix | | Mix | |
|---|---|---|---|
| 1–2 –4 | 6.60 | 1–3–6 | 5.95 |
| 1–2½–5 | 6.20 | 1–2 mortar topping | 11.50 |

(g) Discount of 25c per cu. yd. for payment in 30 days. Special quotations for quantity orders.

**MORGANTOWN, W. VA.**—Prices for jobs of 1 to 10 cu. yd., delivered (f)

| Mix | | Mix | |
|---|---|---|---|
| 1–2–3 | 9.25 | 1–2½–4 | 8.65 |
| 1–2–4 | 8.75 | 1–2½–5 | 8.25 |

(f) Prices subject to cash discount of 25c per cu. yd. for payment 15 days from date of invoice.

**NEW ORLEANS, LA.** (h)—Plant prices per cu. yd. for 30 yd. or less.

| Mix | Cement Portland | Cement "Incor" | Mix | Cement Portland | Cement "Incor" |
|---|---|---|---|---|---|
| 1–4 –8 | 5.15 | 6.10 | 1–2–2 | 7.70 | 10.25 |
| 1–3 –6 | 5.75 | 7.00 | 2–3–6 | 8.05 | 10.55 |
| 1–3 –5 | 5.95 | 7.35 | 2–3–3 | 8.85 | 12.00 |
| 1–2½–5 | 6.25 | 7.80 | 1–1½ topping | 10.95 | 15.80 |
| 1–2½–4 | 6.40 | 8.15 | 1–2 topping | 9.30 | 13.25 |
| 1–2 –4 | 6.75 | 8.60 | 1–3 topping | 7.85 | 10.85 |
| 1–2 –3 | 7.20 | 9.40 | | | |

Plant prices per cu. yd., 30 cu. yd. or over:

| Mix | Cement Portland | Cement "Incor" | Mix | Cement Portland | Cement "Incor" |
|---|---|---|---|---|---|
| 1–4 –8 | 4.65 | 5.45 | 1–2–2 | 6.95 | 9.15 |
| 1–3 –6 | 5.15 | 6.25 | 2–3–6 | 7.25 | 9.45 |
| 1–3 –5 | 5.35 | 6.55 | 2–3–3 | 8.00 | 10.70 |
| 1–2½–5 | 5.65 | 7.00 | 1–½ topping | 9.85 | 14.10 |
| 1–2½–4 | 5.80 | 7.25 | 1–2 topping | 8.40 | 11.80 |
| 1–2 –4 | 6.05 | 7.70 | 1–3 topping | 7.05 | 9.60 |
| 1–2 –3 | 6.50 | 8.40 | | | |

(h) All prices subject to 5% 15 days, 30 days net. Haulage based on various zones.

**NEWARK AND HARRISON, N. J.**§

| | | | |
|---|---|---|---|
| 1–2 –4 | 6.50 | 1–3– 6 | 6.25 |
| 1–3 –5 | 6.00 | 1–2½–5 | 6.50 |

§Discount of 2% if paid by 10th of month following delivery.

**NEW YORK CITY, N. Y.**‡—Prices per cu. yd.

| Manhattan and Bronx Mix | | Queens Mix | |
|---|---|---|---|
| 1–1½–3 | 10.00 | 1–1½–3 | 8.50 |
| 1–2 –4 | 9.25 | 1–2 –4 | 8.00 |
| 1–2½–5 | 8.75 | 1–2½–5 | 7.75 |
| 1–3 –6 | 8.25 | 1–3– 6 | 7.50 |

Westchester County (within radius of 7 miles)

| | | | |
|---|---|---|---|
| 1–1½–3 | 9.25 | 1–2½–5 | 8.00 |
| 1–2 –4 | 8.50 | 1–3 –6 | 7.50 |

Brooklyn

| Mix | Under 50 cu. yd. | Over 50 cu. yd. | Mix | Under 50 cu. yd. | Over 50 cu. yd. |
|---|---|---|---|---|---|
| 1–1½–3 | 9.50 | 8.50 | 1–2½–5 | 9.00 | 7.75 |
| 1–2 –4 | 9.25 | 8.00 | 1–3 –6 | 8.75 | 7.50 |

‡Special designed mixes on the strength basis priced according to the strength desired.

**OMAHA, NEB.***—Prices per cu. yd. for quantities from 1 to 300 yd., delivered anywhere within the city.

| 28-day strength | | 28-day strength | |
|---|---|---|---|
| No. 1. 3500 lb. sq. in. | 6.75 | No. 3. 2500 lb. sq. in. | 6.25 |
| No. 2. 3000 lb. sq. in. | 6.50 | No. 4. 2000 lb. sq. in. | 6.00 |

Transit-Mix Concrete

| 28-day strength | | 28-day strength | |
|---|---|---|---|
| No. 1. 3600 lb. sq. in. | 6.90 | No. 3. 2600 lb. sq. in. | 6.40 |
| No. 2. 3100 lb. sq. in. | 6.65 | No. 4. 2100 lb. sq. in. | 6.15 |

*Sand-gravel mix used as aggregate. No. 1, 6 sacks cement per cu. yd. concrete; No. 2, 5½ sacks cement; No. 3, 5 sacks cement; No. 4, 4½ sacks cement. For high-early-strength concrete using "Quikard" or other super-cement. add $2.50 per cu. yd.

**PITTSBURGH, PENN.**—Prices for ready-mixed concrete. Prices per cu. yd. delivered, up to 50 cu. yd. (j)

| Mix | Strength | | Mix | Strength | |
|---|---|---|---|---|---|
| 1–1½–2½ | 4000 lb. | 8.10 | 1–2½–4½ | 2500 lb.+ | 7.25 |
| 1–2 –3 | 3500 lb.+ | 7.75 | 1–2½–5 | 2500 lb. | 7.10 |
| Class A | 3500 lb. | 7.60 | 1–3 –5 | 2000 lb. | 7.00 |
| 1–2½–3½ | 3000 lb.+ | 7.50 | 1–3 –6 | 1500 lb. | 6.90 |
| 1–2 –4 Class B | 3000 lb. | 7.40 | | | |

Prices per cu. yd. delivered, over 50 cu. yd. (j)

| Mix | Strength | | Mix | Strength | |
|---|---|---|---|---|---|
| 1–1½–2½ | 4000 lb. | 7.10 | 1–2½–4½ | 2500 lb.+ | 6.25 |
| 1–2 –3 | 3500 lb.+ | 6.75 | 1–2½–5 | 2500 lb. | 6.10 |
| Class A | 3500 lb. | 6.60 | 1–3 –5 | 2000 lb. | 6.00 |
| 1–2½–3½ | 3000 lb.+ | 6.50 | 1–3 –6 | 1500 lb. | 5.90 |
| 1–2 –4 Class B | 3000 lb. | 6.40 | | | |

(j) Class A concrete is a special concrete prepared for the city of Pittsburgh. Plus indicates the strength shown is the minimum strength. Prices vary according to zones. Dealer's commission of 50c per cu. yd. allowed in all zones with exception of Yellow Zone. No commission allowed over 200 cu. yd. Prices subject to cash discount of 25c per cu. yd. for payment 15 days from date of invoice.

**PUEBLO, COLO.**—Prices per cu. yd.‖

Ready-Mixed Concrete

| | Zone 1 | Zone 2 | Zone 3 | Strength, 28-day test |
|---|---|---|---|---|
| Grade A | 7.40 | 7.60 | 7.80 | 3000-lb. |
| Grade B | 7.10 | 7.30 | 7.50 | 2700-lb. |
| Grade C | 6.75 | 6.95 | 7.15 | 2400-lb. |
| Grade D | 6.60 | 6.80 | 7.00 | 2100-lb. |
| Grade G | 6.10 | 6.30 | 6.50 | 1500 lb. |

Cement Mortar

| Mix | Zone 1 | Zone 2 | Zone 3 | Mix | Zone 1 | Zone 2 | Zone 3 |
|---|---|---|---|---|---|---|---|
| 1–2 | 10.00 | 10.20 | 10.40 | 1–3 | 8.50 | 8.70 | 8.90 |

‖Deduct 50c per cu. yd. for orders of 10 yd. or more. For delivery outside of city, add 20c per mile beyond Zone 3.

**ROCHESTER, N. Y.**—Prices per cu. yd.

| Mix | Plant price | Prices for delivery to various zones: Zone 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| 1–2 –3 | 7.00 | 7.75 | 7.90 | 8.05 | 8.20 | 8.35 | 8.50 | 8.65 |
| 1–2½–3½ | 6.55 | 7.30 | 7.45 | 7.60 | 7.75 | 7.90 | 8.05 | 8.20 |
| 1–3 –4½ | 6.20 | 6.95 | 7.10 | 7.25 | 7.40 | 7.55 | 7.70 | 7.85 |
| 1–4 –5 | 6.00 | 6.75 | 6.90 | 7.05 | 7.20 | 7.35 | 7.50 | 7.65 |
| 1–5 –6 | 5.65 | 6.40 | 6.55 | 6.70 | 6.85 | 7.00 | 7.15 | 7.30 |

**SAN ANTONIO, TEX.**—Prices per cu. yd. on city deliveries.‡

| Mix | | Mix | |
|---|---|---|---|
| 1–1½–3 | 6.90 | 1–2½–5 | 6.00 |
| 1–2 –4 | 6.30 | 1–3 –5 | 5.80 |
| 1–2½–4½ | 6.20 | 1–3 –6 | 5.70 |
| | | 1–4 –8 | 5.30 |

‡For deliveries outside of city, 25c per cu. yd. per mile additional. Deduction of 50c per cu. yd. on large orders for delivery one mile of plant.

**SAN JOSE, CALIF.**—Prices per cu. yd. delivered within one mile of plant. (k)

| Mix | Up to 5 cu.yd. | Over 5 cu.yd. | Mix | Up to 5 cu.yd. | Over 5 cu.yd. |
|---|---|---|---|---|---|
| 1–6 | 9.00 | 8.50 | 1– 9 | 8.00 | 7.50 |
| 1–7 | 8.50 | 8.00 | 1–12 | 7.00 | 6.50 |

(k) For deliveries outside of this area add 30c per cu. yd. per mile. Cash discount of 50c per cu. yd. if paid in full by 10th day of following month.

**SANTA CRUZ, CALIF.**—Price per cu. yd. delivered within two-mile radius of plant. (l)

| Mix | Over 5 cu. yd. | Less than 5 cu. yd. | Mix | Over 5 cu. yd. | Less than 5 cu. yd. |
|---|---|---|---|---|---|
| 1–6 (6 sacks cement) | 8.50 | 9.00 | 1–8 (4½ sacks cement) | 7.60 | 8.10 |
| 1–7 (5 sacks cement) | 8.00 | 8.50 | 1–9 (4 sacks cement) | 7.40 | 7.90 |

(l) For deliveries outside of this area add 30c per cu. yd. per mile. Cash discount of 50c per cu. yd. if paid in full by 10th day of following month.

**SPRINGFIELD, ILL.**—Prices per cu. yd.

| Mix | | Mix | |
|---|---|---|---|
| 1–3 –6 | 9.00 | 1–2 –3½ | 10.00 |
| 1–3 –5 | 9.20 | 1–2 –3 | 10.20 |
| 1–2½–4 | 9.45 | 1–1½–3 | 10.55 |
| 1–2 –4 | 9.75 | 1–1 –2 | 11.25 |

**WATSONVILLE, CALIF.**—Prices per cu. yd.‖

| Mix | | Mix | |
|---|---|---|---|
| 1–6 | 9.90 | 1– 9 | 8.50 |
| 1–7 | 9.30 | 1–12 | 7.75 |
| 1–8 | 9.00 | | |

‖Prices are for delivery anywhere within city limits, and are subject to cash disc. of 50c cu. yd. for payment on or before 10th day of following month.

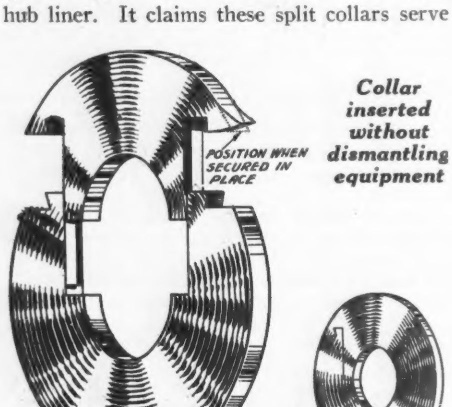
**WILKES-BARRE, PENN.**—Prices per cu. yd. delivered within one mile of plant, subject to discount of 25c per cu. yd. for payment within 10 days from date of delivery. Extra charge of 15c per cu. yd. for each additional mile.

| Mix | Gravel | Stone | Mix | Gravel | Stone |
|---|---|---|---|---|---|
| 1–2 –3 | 7.60 | 7.90 | 1–3–5 | 6.75 | 7.05 |
| 1–2 –4 | 7.30 | 7.60 | 1–3–6 | 6.75 | 7.05 |
| 1–2½–5 | 7.00 | 7.30 | | | |

# New Machinery and Equipment

## Thrust Collar and Hub Liner

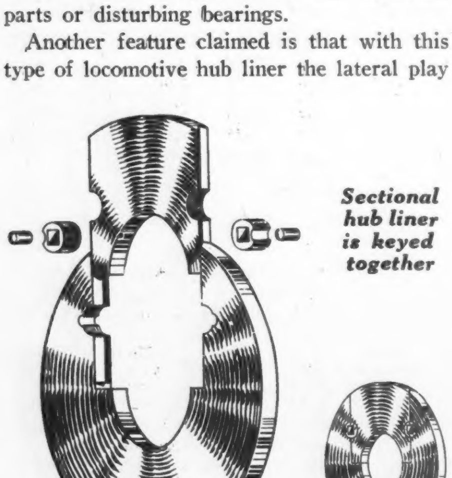
THE QUICK REPAIR Washer Co., Indianapolis, Ind., announces a new type of quick repair thrust collar and locomotive hub liner. It claims these split collars serve




*Collar inserted without dismantling equipment*

the purpose of a solid collar and that the play on journals of shovels or other heavy equipment can be taken up easily and quickly without dismantling the shafting, removing parts or disturbing bearings.

Another feature claimed is that with this type of locomotive hub liner the lateral play



*Sectional hub liner is keyed together*

can be taken up on journals of drivers, engine trucks and trailer trucks without the delay and expense of dropping wheels.

These thrust collars and hub liners are made of phosphorous bearing bronze and can be furnished in any size or thickness to fit any need where a collar is used.

## Truck Tractor Prices Reduced

THE LINN Manufacturing Corp., Morris, N. Y., manufacturers of the "flexible traction unit" Linn truck tractor, has announced price reductions ranging from $1380 to $1625, according to models.

## Announces Refractory

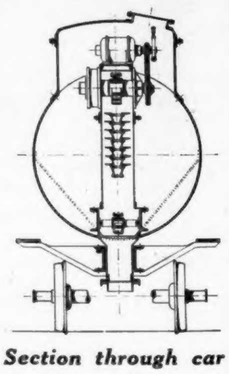
LACLEDE MULLITE is a new refractory announced by Laclede-Christy, St. Louis, Mo. Mullite, of which this refractory is made, is a stable crystalline combination of silica and alumina and is said to be highly refractory. According to the manufacturer, the closely woven network of Mullite crystals which is obtained in this new product has resulted in a refractory of unusual characteristics.

Features claimed for this new brick are that it is non-spalling, it is non-shrinking, it is resistant to slag action, and it has high load bearing capacity.

To provide a high temperature cement of equal quality the company also announces Setskold C-7, a special Mullite base cement said to be an air-setting mortar of unusual bonding strength. It is shipped in 100-, 250-, and 500-lb. metal drums, ready to use.

## Shipping and Unloading Dry Bulk Materials

A NOVEL form of self-unloading tank car for the transportation of dry commodities in bulk has been announced and was described in the April 9 issue of Rock Products. This car was developed by the General American Tank Car Co., in conjunction with the Link-Belt Co., both of Chicago, Ill., and has been designated as the "Dry-Flo" car.

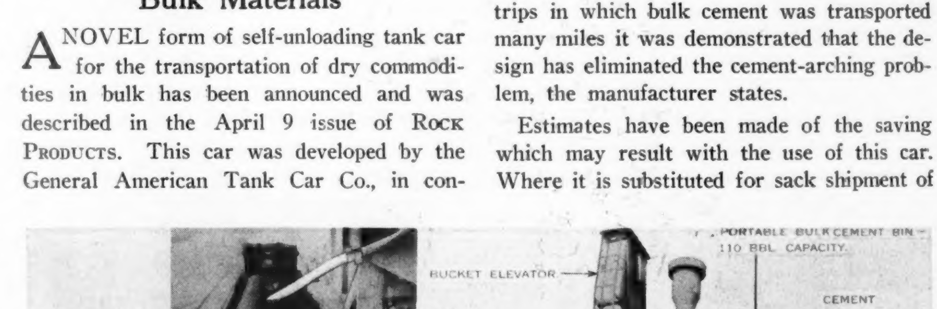


*Section through car*

Equipment for unloading and batching bulk cement from this car has also been given special consideration and a suggested plan is illustrated in an accompanying view. From this it is seen that no track hopper is required. A short screw feeder which may be swung or rolled under the car, above the rails, to receive the material discharged from the bottom outlet is all that is needed. This discharges to a bucket elevator, which, in the accompanying view, is an integral part of a Link-Belt and Blaw-Knox cement batching plant.

Those who are familiar with shipping bulk cement will be interested in the section through the car, which is shown. In test trips in which bulk cement was transported many miles it was demonstrated that the design has eliminated the cement-arching problem, the manufacturer states.

Estimates have been made of the saving which may result with the use of this car. Where it is substituted for sack shipment of




*Unloading bulk cement from car to batching plant*

cement the saving of packages and labor has been estimated at $2 per ton or $130 per trip per carload.

Savings are not confined to eliminating the cost of packaging and labor of loading and unloading, however. In cases where bulk shipments are in a box car, dust is both a loss and nuisance. In other cases, as of certain chemicals, handling is dangerous and so means added cost.

Estimate of savings, made for an oil company that uses hydrated lime instead of the 10% less expensive and 28% more effective quicklime because the latter is dangerous and disagreeable for men to handle, shows a potential saving of $3000 per month or $1000 per car. This is about a dozen times what it will cost to lease the car from the General American company, it is said.

## Vibrator Screen

IN ANNOUNCING a new vibrator screen, the Stephens-Adamson Manufacturing Co., Aurora, Ill., emphasizes the fact that each screen is built with a vibrating unit assembled to suit the material handled.

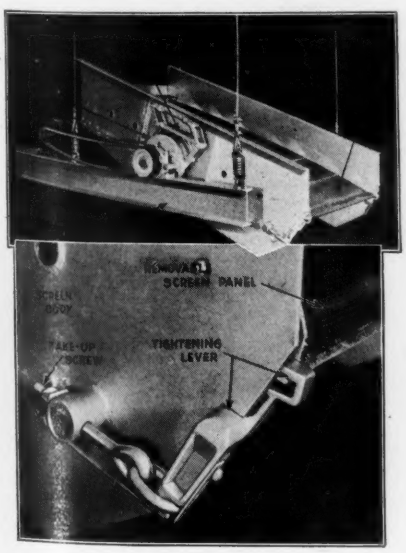
The manufacturer states that a series of tests proved the relationship between the nature and size of material to be screened and the amplitude, frequency and angle of vibration. The new S-A screen was built as a result of these tests and has several features which are claimed to increase screening capacity, decrease maintenance costs and reduce leakage of vibration to building supports.

The screen is of the positive vibration type, in which a rigid screen body with one or more decks is given a vibration of fixed amplitude by the rapid "throw" of an eccentric shaft. There are three units—screen body, vibrating mechanism and subframe.

The vibrating mechanism is a self-contained, factory adjusted unit. It consists of an eccentric shaft, adjustable balance wheels, SKF, double row bearings, grease seals and a rigid tubular housing. In recommending screens the engineers require definite data on materials, sieve analysis, capacities and characteristics. From these the vibrating unit and drive are assembled to give the vibration frequency and amplitude.

Several other features have been built into the screen, chief of which are quick-change screen panels and a stabilizer mounting.

It is claimed the stabilizer unit, which eliminates bumper springs, reduces subframe vibration. An additional advantage claimed for the stabilizer is that by loosening two bolts the operator can tilt the screen body clear of chutes for making panel changes or change the screening angle to increase screening efficiency for different volumes of material.




*Method of stretching screen panels*

## Refractory

E. J. LAVINO AND CO., Philadelphia, Penn., announce an improved line of "Lavino" chrome brick. The features claimed for this improved brick are that there is less spalling and cracking, that it has greater resistance to penetration of destructive elements, that it has higher hot load strength, that it has greater resistance to abrasion and erosion, and that it has an increased sagging point.

In shipping, paper packing has been adopted as standard for all carload lots.

## Road Broom

A ROAD BROOM, formerly manufactured in the Pacific northwest and known as the Owen road broom, is now being manufactured by the Speeder Machinery Corp., Cedar Rapids, Ia. It is recommended for maintenance of gravel roads.

## Soft Stone Eliminator

A MACHINE is announced by the F. M. Welch Engineering Service, Inc., Greenville, Ohio, which is claimed to eliminate unsuitable foreign material from aggregate.

The machine, known as the Greenville "soft stone eliminator," is of the rotary type, wherein every stone receives two or three distinct hard blows as the material passes through. The speed is so regulated after installation that the soft stone is pulverized and the commercial stone is unbroken. This permits the soft aggregate to be screened out in the next operation.

The economy of the Greenville [illegible] stone eliminator lies in the small space [illegible] occupies and the low power requirements. A machine approximately 3 ft. 6 in. square will handle 50 to 100 tons per hr. and requires less than 10 hp. to operate, the manufacturer states.

It is said that in tests from 60 to 90% of the soft stone has been removed without injuring the marketable gravel.

## Announces Foreign Business Department

THE Dust Recovering and Conveying Co., Cleveland, Ohio, announces the formation of a foreign business department, and has adopted a policy of licensing foreign manufacturers in the principal industrial countries to build and sell, in their own territories, dust collecting and pneumatic conveying equipment from its "Dracco" designs.

For Britain, and the Overseas Dominions, except Canada, the company has become associated with the Power-Gas Corp., Ltd., of Stockton-on-Tees, England, gas and chemical plant engineers and constructors.

In order to further relations with licensees in continental Europe, an office of the Dust Recovering and Conveying Co. has been established at 77 Rue des Tanneurs, Brussels, Belgium, under the management of the engineers of Tevo, Ltd. Preliminary engineering advice, construction details, etc., will be supplied by the Brussels office, while all final engineering layouts will be handled through the foreign department of the company in Cleveland.

## Ships Large Conveyor Belt

THE CINCINNATI Rubber Manufacturing Co., Cincinnati, Ohio, recently shipped what it believes is the largest conveyor belt ever built in a single length. This belt is of 8-ply construction 42 in. wide with 3/16-in. top cover. It was 13/16-in. thick and was 1615 ft. long, weighing 28,370 lb.


*Eliminates soft foreign material from aggregate*

# News of All the Industry

## Incorporations

**Raritan Materials Corp.**, Perth Amboy, N. J., $1,000. To produce cement and gravel.

**Menifee Limestone Co.**, Frenchburg, Ky., $5,000. Dorsey Ratliff, D. R. Pieratt, Henry Wells and Ben Wells.

**Merrill Gravel Co.**, Merrill, Ia., $15,000. J. Nason, manager, and J. H. Nason, secretary-treasurer.

**Ventmore Asbestos Co.**, 122 E. 42nd St., Manhattan, New York City, $20,000. A. J. Kalmanowitz.

**Huntsville Stone and Crusher Co.**, Huntsville, Texas, decreasing capital stock from $100,000 to $15,000.

**Breezy Hill Rock Quarry Co., Inc.**, Jeffersonville, Ind, $1,400. Frank A. Bonenberger, Hattie P. Bonenberger, William C. Bowerman and Nettie V. Bowerman.

**Crescent Marble and Tile Co.**, Florida National Bank, St. Petersburg, Fla., 150 shares of no par value. C. F. Harrison, H. C. Andrews, and C. I. Carey, directors. To produce concrete products.

**Montana Sandstone Corp.**, Columbus, Mont., $50,000. Paul O. LeBahn, Ernest L. Hallbauer, and Ernest Hallbauer of Chicago. To quarry sandstone.

**Jersey Stone Co.**, Newark, N. J., $100,000, consisting of $50,000 Class A common and $50,000 Class B common. John M. Allen, Maplewood, N. J., Thomas J. Allen, Harry C. Holmes and Elias A. Schenkan, Newark.

**Fairfax Stone Co.**, Bloomington, Ind., 2500 shares of no par value, consisting of 1500 Class A and 1000 Class B common stock. President, Girard Anderson, South Walnut St., Bloomington; T. J. Louden, A. R. Louden, Bloomington, and Ross M. Correll and Victor Arena, Bedford, Ind.

## Quarries

**San Antonio Rock Products Co.** has been formed and has established a 300-ton plant at San Bernardino, Calif. J. H. Briscoe is president and J. Allen Cassidy is general manager.

**National Lime and Stone Co.**, Bluffton, Ohio, is discussing proposed plan for the state to take over a 27-acre water-filled quarry for the state game and fish department.

**Cleveland Quarries Co.** has closed its quarries at Berea, Ohio, for the first time in 90 years. A feature story describing the development and history of this quarry was recently carried in the *Cleveland Press*.

**Dallas, Ore.** There is real possibility that the quarry operated two years by the March Construction Co. here will reopen under new management to produce and sell agricultural limestone. Extensive boring has been carried on for two months to determine the size and character of the deposit.

## Sand and Gravel

**Paducah Sand and Gravel Co.**, Evansville, Ind., has filed notice of preliminary dissolution.

**Pacific Coast Aggregates, Inc.**, lost its gravel washing house at its Fair Oaks, Calif., plant from fire recently.

**Guy Nowels and son** have installed a sand pump in the Solomon river on their place near Glasco, Kan., and are piling up washed sand and gravel for county road work.

**North Jersey Sand and Gravel Co.**, Carpentersville, N. J.; K. F. Kressler of Easton, Penn., T. L. Murphy of Phillipsburg, and Elmer H. Geran of Matawan have been appointed receivers.

**Rochester, Ind.** Stripping operations were started recently in a gravel pit on the James Palmer farm near here. Mr. Palmer is operating the pit and reports a number of orders have been received.

**Iowa Gravel and Fuel Co.**, Dubuque, Ia., has surrendered its certificate of incorporation, the firm having announced its termination as an entity. All interests in the fleet of barges and dredge equipment for the production and sand and gravel have been disposed of.

**Bruce Maxwell** has purchased a half interest in the Fall Creek Gravel Corp., Indianapolis, Ind., from Wallace Mains. Mr. Maxwell, who operated the Maxwell Gravel Co. for 20 years, becomes president of the Fall Creek company and John Hessong, the other owner, becomes vice-president and treasurer.

## Cement

**Alpha Portland Cement Co.** was recently host to a group of engineering students from the University of Alabama at its Birmingham plant.

**Riverside Cement Co.**, Los Angeles, Calif., is making arrangements to ship bulk cement from the Riverside plant to the Hoover Dam.

**Southwestern Portland Cement Co.** was recently host to a group of 100 students at its Victorville, Calif., plant.

**Lawrence Portland Cement Co.** announces its Thomaston, Me., plant will go on an 8-hour schedule with three shifts daily. Previously the day shift worked 10½ hr. and the night shift worked 13½ hr.

**Superior Portland Cement, Inc.** held its annual safety rally for its Concrete plant March 30. Service pins were awarded to veteran employes by President Lucas and Vice-President Reitze gave prizes for winners in the safety essay contest conducted in the Concrete schools.

## Cement Products

**Art Stone Co.**, Gloversville, N. Y., has let contract for an addition to its plant. It manufactures cast stone.

**Knoxville Mausoleum Co.**, Knoxville, Tenn., has been organized to manufacture burial vaults, garden furniture and other miscellaneous products.

**Stone-Tile and Supply Co.**, Roanoke, Va., has completely designed and built a number of five-room masonry houses to sell at about $5000. The houses are quite attractive.

**Pacific Building Materials Co.**, Portland, Ore., has extended its activities to include standard sizes of building units. Harold Blake is manager of the company.

**L. E. Wood**, Alhambra, Calif., has announced plans to install a products plant in Azusa, Calif. He intends to manufacture plain and fancy tile by a new process.

**Wapakoneta Cement Block Co.**, Wapakoneta, Ohio, has been purchased by the Howell Coal and Builder Supply Co. from the receiver. Operation of its business has been resumed.

**Stone Products Co.**, Albany, N. Y., announces a new hydraulic concrete tile for floors and walls. The tile is manufactured in four colors and national distribution is being developed.

**Washington Concrete Pipe Co.**, Vancouver, Wash., has equipped and placed in operation a plant to manufacture concrete culvert and sewer pipe. It is understood production will be extended to other lines.

**Chandler and Co.**, Knoxville, Tenn., announces it is sales agent for the Warren "Dry Joint" wall coping, a cast stone product of interesting design which eliminates need of mortar between coping units.

## Lime

**Auburn, Calif.** Civil action brought by the California Lime Products Co. charging misrepresentation in the sale of property near Towle, Calif., to it has been settled in favor of the defendants.

**Gager Lime Co.**, Chattanooga, Tenn., has appointed Lake-Spiro-Cohn, Inc., Memphis, to direct advertising of Gager's house and garden line. Newspapers and radio will be used.

**Ohio Blu Limestone Co.**, Marion, Ohio, has offered a group of high school boys, known as the "Future Farmers of America" organization in Mt. Gilead, 80 tons of agricultural limestone for experimental purposes.

**Eagle Rock Lime Co.**, Eagle Rock, Va., has asked that an abandoned bridge, resulting from relocation of the Chesapeake and Ohio railroad and a state highway, be left in place. In its request the company claims that if the bridge is removed it will practically put it out of business because of increased transportation cost.

## Silica

**Silica Products Co.**, Everton, Ark., is opening a sand pit and installing equipment there. The company specializes in glass sand and previously has shipped from Guion, Izard county.

## Miscellaneous Rock Products

**Butler Bros.**, St. Paul, Minn., are reported to plan erection of a $40,000 Fuller's earth plant in Barbour county, Ala.

**Portsmouth Refractories Co.**, Portsmouth, Ohio, is now manufacturing a silica brick at its plant there.

**Inter-Mountain Mineral Products Co.**, Burley, Ida., has completed a road from its marble quarry to the crushing plant at Marion and is now producing chicken grit.

**Northwest Magnesite Co.**, Chewelah, Wash., has increased its crew at the plant and quarry and reports good prospects for work through the summer.

**Deer Lodge, Mont.** Reports are that a Fuller's earth plant will be established at Race Track to refine material from a deposit at the Lincoln mine. Among other products to be manufactured will be a soap.

## Personals

**Louis J. Brunel** has been elected a director of the Calaveras Cement Co., succeeding F. L. Taylor.

**R. T. Gow** has been named district sales manager at Tulsa, Okla., for the Monarch Cement Co., succeeding the late John P. Thompson.

**R. S. Jamar** of the United States Gypsum Co., addressed the Fort Worth Technical Club at its luncheon recently.

**Raymond B. Ladoo**, formerly with the United States Gypsum Co., Chicago, Ill., has resigned to open a consultant's office at Belmont, Mass., for sales and consulting work on nonmetallic minerals.

**E. R. Hill**, general superintendent of the United States Gypsum Co. plant at East Chicago, Ind., recently addressed the East Chicago, Ind., Kiwanis Club.

**Herbert Helwig**, superintendent of the Metaline, Wash., plant of the Lehigh Portland Cement Co., is making a trip by boat through the Panama Canal to the company's Allentown, Penn., office.

**Frank M. Traynor**, vice-president and general manager of the Florida Portland Cement Co., has been elected president of the Tampa, Fla., chamber of commerce.

**H. E. Kerby** has been appointed sales manager of the Lone Star Cement Co., Pennsylvania, succeeding R. J. Mahon, who has been transferred to the New York office of the International Cement Corp.

**Eugene Enloe**, president of Idaho Portland Cement Co., in announcing the reopening of its plant, said: "While there is not the road construction in southern Idaho that we have in Washington, still we are preparing for a normal volume of business."

**Norman G. Hough**, president and general manager, National Lime Association, Washington, D. C., in testifying before a sub-committee of the Federal Trade Commission recently said that in his opinion a non-conforming minority of an industry should be bound by rules of conduct adopted by a majority and approved by the Federal Trade Commission regardless of whether the minority was represented at such conference. He also said that there was dissatisfaction in industry because of uncertainty that the Federal Trade Commission might make changes in the rules it previously had approved.

## Obituaries

**Reginald Clarke**, vice-president of the Audley Clarke Co. and of the Central Concrete Mixing Co., New York, N. Y., and who was shell-shocked and gassed while serving in France, recently died

*Recognized the World Over as the Leader in Its Field*

# Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS — Founded 1896

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